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PHILIPPINE ALCYONARIA, II

THE FAMILIES ALCYONIIDÆ AND NEPHTHYIDÆ

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FIVE PLATES

Although the littoral alcyonarians of Ternate, Zanzibar, Maldive and Laccadive Islands, and Amboina have been thoroughly worked out, those of the Philippines await a considerable amount of investigation. Prior to 1910 Philippine alcyonaria had been dealt with only incidentally by Wright and Studer (1889) in their Challenger Report, and by May (1899) who described a few specimen collected by Sanderson, Jagor, and Müller. It was thus natural that Light (1913–1915) in a series of papers should deal with several genera of the group. Not satisfied with working alone on this group, he also sent a large part of the alcyonarian collection of the University of the Philippines to Prof. W. Kükenthal, then at Breslau University. A small portion of the collection was worked out by Lüttschwager (1922) and by Kolonko (1926). The greater bulk of the collection, composed of various genera of the Nephthyidæ, was sent later to the Berlin Museum and was entrusted to Prof. J. Moser. When the writer went to Europe for alcyonarian study, he had occasion to study this and compare the representatives of the old collection with the newly collected materials. This work represents the second half of the work on Philippine Alcyonaria done under the joint auspices of the University of the Philippines and the John Simon Guggenheim Memorial Foundation.

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Family ALCYONIIDÆ Verrill

Alcyoniidæ VERRILL, Proc. Essex Inst. No. 5 4 (1865) 148.
Alcyoniidæ KÖLLIKER, Verhdlg. d. Phys.-med. Gesellsch. in Wurzburg (1867).
Alcyoniidæ VERRILL, Proc. Essex Inst. 6 (1869) 46.
Alcyoniidæ KLUNZINGER, Die Koralltiere des Roten Meeres. Berlin 1 (1877) 21.
Alcyoniidæ WRIGHT and STUDER, Challenger Report Zoöl. 31 (1889) xviii u. 238.
Alcyoniidæ MAY, Beitrage zur Systematik und Chorologie der Alcyonaceen (1899) 91–99.

The family Alcyoniidæ was first established by Verrill in 1865. Wright and Studer in 1889 included eleven genera under it. These are *Krytallophanes, Bellonella, Nidalia, Paralcyonium, Sarakka, Alcyonium, Lobularia, Sarcophyton, Lobophyton, Anthomastus,* and *Nannodendron.* Later May (1899) removed *Nannodendron* from the family and placed it under Nephthyidæ and united *Bellonella* with *Nidalia,* and *Lobularia* with *Alcyonium.* To the above, *Metalcyonium* Pfeffer (1889), *Daniela* v. Kock, and *Sinularia* May have yet to be added. Finally, Kükenthal (1906) created *Nidaliopsis* and included only eight genera under the family, at the same time dividing *Alcyonium* into three subgenera; namely, *Metalcyonium, Erythropodium,* and *Eualcyonium.* Of all these there are only eight very distinct genera, a key to which follows.

Alcyoniidæ are Alcyonacea in which the colony is divisible into a sterile stem and a polyp-bearing disc or capitulum whose outer surface may appear mushroomlike, branched, lobed, or otherwise provided with long or short processes. The disc in certain cases may also be smooth or simple and poorly differentiated. The polyps are united by a well-developed cœnenchymal mass in such a way that at the stalk the boundaries of the individual polyps are difficult to see. The gastral canals of the polyps are joined to each other by means of canal nets or solenia. Mesenterial filaments are present in all mesenteries. Usually there is polyp dimorphism, but in certain cases the siphonozooids, as a result of retrogressive development, may be absent. The commonest sclerites are sticks, spindles, double spindles, and barrels or cylindroids with warts that may be in the form of girdles.

Key to the genera of the Alcyoniidæ.

a^1. Polyps with calyx, not fully retractile into disc.... Subfamily NIDALIINÆ.
  b^1. Sclerites are sticks and spindles..... *Nidalia.*
  b^2. Sclerites are barrels and cylinders..... *Nidaliopsis.*
a^2. Polyps without calyx, fully retractile into disc.... Subfamily ALCYONIINÆ.
  b^1. Entire disc retractile into stalk..... *Paralcyonium.*
  b^2. Disc not retractile into stalk.
    c^1. Polyps not confined to disc; may also be on stalk.
      d^1. Sclerites of base always large spindles, more than 2 mm long. *Sinularia.*
      d^2. Sclerites of base of various types, less than 2 mm long. *Alcyonium.*
    c^2. Polyps confined to disc, usually none on stalk, with dimorphism.
      d^1. Disc with fingerlike, closed lobes..... *Lobophytum.*
      d^2. Disc with smooth or open folds.
        e^1. Sex products produced on autozooids; polyps only on upper surface of disc; species mostly littoral..... *Sarcophyton.*
        e^2. Sex products on siphonozooids; polyps on both upper and lower surfaces of disc; mostly deep-sea forms..... *Anthomastus.*

Of the above-named genera only *Sinularia, Alcyonium* (subgenus *Eualcyonium*), *Lobophytum,* and *Sarcophyton* have been found in Philippine waters. *Nidalia* is sporadically distributed in Japan, Indian Ocean, and West Australia; *Nidaliopsis* is a deep-sea form, reported only from Congo, while *Anthomastus* is a deep-sea species confined to subarctic and subantarctic portions of the Atlantic Ocean.

Genus SINULARIA May

Sinularia MAY, Mitt. Mus. Hamburg 15 (1898) 24.
Sinularia MAY, Jena. Zeitschr. f. Naturw. 33 (1899) 101.
Sclerophytum PRATT, Alcyon. Maldives Pt. II (1903) 516.
Sinularia KÜKENTHAL, Alcyon. Deutsche Tiefsee-Exp. (1906) 54.
Sinularia COHN, Alcyon. Madagaskar u. Ostafrika, Reise Voeltzkow 2 (1908) 225.
Sinularia LÜTTSCHWAGER, Arch. Naturg. Abtg. A. 10 (1914) 1.
Sinularia KOLONKO, Mitteil. Zoöl. Mus. Berlin 12 (1926) 2.

May in 1898, working out the Alcyonaria of East Africa in the Hamburg Museum, described *Sinularia brassica,* a new genus and species, although he did not work out its internal anatomy. Pratt in 1903, on anatomical grounds, separated a group of animals from Marenzeller's *Lobophytum,* and called it *Sclerophytum,* in which he also included May's *Sinularia brassica.* From all the works reviewed it appears that there is actually

no difference between *Sclerophytum* and *Sinularia*, and therefore the latter name, which is about five years older, must be used.

Sinularia is a genus of Alcyoniidæ where the polyp-bearing disc is not sharply delimited from the sterile stalk. The disc or capitulum is usually composed of fingerlike or lobelike processes in which most of the zooids are located. Siphonozooids are almost always very rudimentary. Stalk cortical sclerites are small clubs with well-developed heads. In stalk cœnenchyma are very large spindles which may be 1 cm long in which, however, the warts or thorns are never arranged in the form of whorls or girdles.

Members of the genus *Sinularia* are confined to the warmer Indo-Pacific waters. With the exception of Port Denison (west coast of Australia), all places where the genus has been reported are within the Torrid Zone, from the east coast of Africa to the middle of the Pacific. There are no less than twenty-nine species and varieties described as belonging to the genus. Twenty-three of these seem to be valid; only ten of them have been encountered in the Philippines.

Key to the Philippine species of Sinularia May.

a^1. Colony with fingerlike processes on capitulum.
  b^1. A central terminal wart on cortical club head absent.
    c^1. Cortical club head branched.
      d^1. Basal rim present on stalk..... *S. lochmodes* Kolonko.
      d^2. Basal rim absent..... *S. triaena* Kolonko.
    c^2. Cortical club head unbranched.
      d^1. Basal rim present; disc processes not very long.
        e^1. Cortical club head not knotty..... *S. leptoclados* (Ehrenberg).
        e^2. Cortical club head knotty.
          S. leptoclados var. *gonatodes* Kolonko.
      d^2. Basal rim absent; disc processes very long and slender.
        S. flexibilis (Quoy and Gaimard).
  b^2. A central terminal wart present on cortical club head.
    c^1. Fingerlike processes of disc very short..... *S. mayi* Lüttschwager.
    c^2. Fingerlike processes very long.
      d^1. Warts of stalk cœnenchymal sclerites crenulate.
        e^1. Fingerlike processes close together.
          S. polydactyla (Ehrenberg).
        e^2. Fingerlike processes spreading.
          S. polydactyla var. *dialichana* Kolonko.
      d^2. Warts of stalk cœnenchymal sclerites not crenulate.
        S. polydactyla var. *mollis* Kolonko.
a^2. Colony with lappetlike processes..... *S. macrodactyla* Kolonko.

SINULARIA LOCHMODES Kolonko.

S. lochmodes KOLONKO, Mitteil. Zoöl. Mus. Berlin 12 (1926) 300, pl. 1, figs. 1–3.

Colony bushy in appearance with a strong stalk, with clear basal line and numerous fine fingerlike processes about 2 mm in diameter. Cortical sclerites are clubs with branched heads but without any central wart.

Colony bushlike in form. From a strong stalk or from a high basal plate, a number of thick upright branches arise. These in turn give off few or many secondary branches. The terminal branchlets are fingerlike processes not more than 50 mm long and 2 to 3 mm wide. They may also arise directly from the main stem. Around the base of the stalk is a clear basal line. The polyps are about 1 mm apart and regularly arranged in smaller processes. In the stalk cortex are clubs 0.07 to 0.1 mm long with a few or many stumpy warts on stalk. The head of the clubs is branched, and is composed of three or more thorns at the tip, which are obliquely directed to the outside just behind which is a ring of strong processes rounded at the ends that stand out almost perpendicularly from the stalk. No wart that may be called central is present. In addition, larger clubs with stalks as long as 0.25 mm with few warts and also slightly bent sticks or spindles 0.2 to 0.45 mm long slightly thickened at one end are present in the cortex. In the stalk cœnenchyma are straight or bent spindles provided with conical or semispherical warts on which are many small knobs. These spindles are from 0.5 to 8 mm long and from 0.06 to 1 mm thick.

Reported from Puerto Galera and Palawan.

SINULARIA TRIAENA Kolonko.

S. triaena KOLONKO, Mitteil. Zoöl. Mus. Berlin 12 (1926) 304, pl. 1, fig. 4.

Colony with thin corrugated stalk and a capitulum divided into rounded branches or flat lobes. Terminal branches are fingerlike lobes rounded at tip. Stem without basal line; head of cortical clubs without a central wart: arms on head limited to three.

Colony with a low disclike base which is slightly folded upwards around the rim. This gives rise to very thick, short, rounded branches, 1 to 2 cm wide and flat lobes, about 3 cm wide that divide in turn to form secondary and tertiary rounded

fingerlike processes as long as 0.5 cm. The polyps on the disc as well as on the primary lobes and branches are arranged in little raised groups. On the processes they are regularly distributed, about 1 to 2 mm apart. Sclerites of the cortex are mostly clubs, 0.15 to 0.17 mm long with a smooth or slightly warted pointed stalk. The head of the clubs is composed of three oblique armlike processes that get thicker at the ends and become divided into two to four short rounded knobs. There is no central wart. Besides the clubs, small, smooth, spindle-like sticks 0.1 to 0.2 mm long and 0.02 mm wide are also present in the cortex. In the cœnenchyma are spindles 1 cm long and 1 mm wide. They are covered with large, semispherical or conical warts with many small knobs.

Type obtained from the canal between Palawan and Mataguit Islands.

SINULARIA LEPTOCLADOS (Ehrenberg). Plate 2, fig. 8.

Lobularia leptoclados EHRENBERG, Corallth. Roten Meeres (1834) 58.
Sinularia leptoclados LÜTTSCHWAGER, Arch. Naturg. Abt. A. Heft 10 (1914) 3.

Colony encrusting or bushlike with fingerlike processes. Cortical clubs with unbranched head and without a central wart. Stalk has a definite basal line.

Colony encrusting or bushlike, the basis definitely set off from the rest of the stalk by the basal line. The stem has few or many longitudinal furrows, while the capitulum is slightly enlarged and not much branched. The terminal processes are sometimes fingerlike, sometimes only slightly longer than wide. Polyps are regularly distributed on the capitulum, about 1 mm apart. They may occasionally be found also on the stem. Siphonozooids are fully rudimentary. Cortical sclerites are small clubs, 0.05 to 0.12 mm long with head 0.025 to 0.03 mm wide. The head is unbranched and is made up of many obliquely directed elongate knobs or stumpy warts that are closely crowded together. Central wart absent. The stalk is almost smooth except for a ring of a few small knobs near its almost blunt end. A few clubs are larger, 0.08 to 0.15 mm long, with similar head but with stalk provided with few and short warts. In addition sticklike or spindlelike bodies, 0.1 to 0.25 mm long and 0.02 to 0.035 mm wide, are also present on the stalk cortex. In the cœnenchyma are straight or bent spindles up to 7 mm long and 0.6 mm wide with slightly rounded ends. They are provided

with warts that are either large, stumpy, and granular, or rather rugged and standing together in small heaps.

Reported from Ceylon, Amboina, Western Australia, and the Red Sea. Philippine material obtained from Batas Island, Taytay Bay, and Puerto Galera Bay.

SINULARIA LEPTOCLADOS (Gray) var. GONATODES Kolonko.

S. l. var. *gonatodes* KOLONKO, Mitteil. Zoöl. Mus. Berlin 12 (1926) 309, pl. 2, fig. 1.

Outer appearance of colony similar to that of the typical species except that the branches do not diverge so strongly. The polyps are visible from just above the sharp basal line where they are found in large numbers. Besides the typical clubs found on the stalk cortex of the typical species, numerous clubs, on the average 0.125 mm long, with strongly warted stalk, are found. The small processes on the head are so closely crowded together that they appear like a simple knotty mass from which only the stumpy ends of the warts extend slightly. In addition, small sticks about 0.25 mm long, with a somewhat thickened end where the small knobs are more thickly crowded, are present on the cortex. Small irregular calcareous bodies are also seen. Sclerites of stalk interior are small spindles, 1 to 3 mm long and 0.2 to 0.35 mm wide, covered with numerous strongly crenulate warts.

Type of variety from Batas Island, off the east coast of Palawan.

SINULARIA FLEXIBILIS (Quoy and Gaimard). Plate 2, fig. 10.

Alcyonium flexibile QUOY and GAIMARD, Voy. Astrolabe 4 (1833) pl. 23, figs. 1–3.

Sinularia flexilis (err.) LÜTTSCHWAGER, Archiv. Naturg. Abt. A Heft 10 (1914) 11.

Colony tall, bushy, with very long, slender, tubelike processes of disc. Stalk without basal line. Sclerites absent from terminal processes. Cortical clubs with unbranched head without a central wart.

Colony very bushy in appearance. Stalk cylindrical, columnar and usually tall without any distinct boundary between the calcareous base and the rest of the stalk. This divides into primary, secondary, and tertiary branches which are very sensitive to touch. Tertiary branches contract tremendously when fixed and in this condition are usually about 3 mm in diameter. They are very long, fingerlike or tubelike, completely devoid of

sclerites. In contracted specimens autozooids are closely set, usually less than 0.5 mm apart, especially on the tertiary branches. Cortical sclerites are irregular clubs 0.06 to 0.13 mm long, more or less triangular in general outline, with irregularly placed warts. Club head unbranched, knotty in appearance, composed of several stumpy warts, while the end of stalk is more or less pointed. Besides the clubs, there are other irregular tiny calcareous sclerites. Stalk interior full of large spindles 0.7 to 2.5 mm long and 0.2 to 0.4 mm wide with thickly set, low, almost rounded warts.

Colonies usually very large.

Reported from Vanikoro, Fiji, Amboina, Samoa, Pelew Islands, and Cebu and Mindoro, Philippines.

SINULARIA MAYI Lüttschwager. Plate 2, fig. 6.

S. mayi LÜTTSCHWAGER, Arch. Naturg. Abt. A Heft 10 (1914) 6.

Colony either medium in height or very low and flat but always with a slightly expanded disc on which numerous, short, fingerlike lobes of uniform length are present. Clubs with a central wart; sclerites of stalk may be more than 4 mm long. Basal line absent.

Colony either with a strongly developed stem with many longitudinal ridges and broadened capitulum which is slightly branched, or the colony may be just a low flat disc with its outer part thrown up into a collarlike rim. The numerous lobes of the disc are short, closely set, mostly flattened laterally and almost of the same height all over. Although the polyps are confined to the capitulum, there is no sharp line separating the polyp-bearing and sterile portions of the colony. Sclerites of cortex are small clubs 0.07 to 0.12 mm long, with heads 0.04 to 0.06 mm wide. The head is a large, tripartite structure, with one central and two more or less horizontal arms. All these arms may carry one or more small knobs. Towards the stalk of the club few knobs sometimes arranged ringlike are present. Besides these smaller clubs, there are very few larger ones, reaching 0.18 mm long and 0.05 mm wide with fewer larger stumpy warts that are not arranged in a regular radiating manner as in the smaller clubs. In addition, small poorly warted sticks and spindles, about 0.15 mm long and 0.035 mm wide, are also present on the cortex. Sclerites of the stalk interior are straight or slightly bent spindles, 1 to 4.5 mm long and as much as 0.4 mm wide, with simple or compound warts.

This species was formerly included under *S. polydactyla* by Burchardt. Unlike this, however, *S. mayi* has the lobes not lying one over the other, but closely arranged, one after another and more or less flattened laterally.

SINULARIA POLYDACTYLA (Ehrenberg). Plate 2, fig. 7.

Lobularia polydactyla EHRENBERG, Corallth. Roten Meeres (1834) 282.
Alcyonium polydactyla DANA, Zoopytes (1846) 617.
Amocella polydactyla GRAY, Ann. & Mag. Nat. Hist. 3 (1876) 125.
Sclerophytum polydactyla PRATT, Alcyon. Maldives pt. 2 (1902) 524.
Sinularia polydactyla COHN, Alcyon. v. Madagascar und Ostafrika, Reise Voeltzkow (1908) 229.

Colony encrusting, or with a rugged, long or short, sterile stalk and a capitulum with large, flattened, closely crowded, fingerlike processes that arise from lobelike branches. Clubs provided with central wart; inner stalk sclerites over 3 mm long and with crenulate warts.

Colony either more or less encrusting or columnar. In the encrusting form, the disc is more or less distinctly set off from the very short stem by means of a slightly undulating rim. In the columnar form, such a rim is absent; the stalk is irregular, thrown up into large or small longitudinal folds, and the disc is composed of several large, rounded or flattened branches which again subdivide into a number of elongate fingerlike processes several centimeters long. Basal rim is either indefinite or entirely wanting. Autozooids mostly confined to disc of colony, 0.5 to 1.5 mm apart. Cortical clubs are 0.075 to 0.175 mm long and with a head 0.03 to 0.07 mm wide. The head is provided with three warty arms which stand almost perpendicularly from the stalk, and a single isolated knotty central wart at tip. The next rows of warts are located about middle of stalk. Other smaller warts are found towards the slightly rounded end of club stalk. Small sticks and spindles up to 0.25 mm long and 0.04 mm wide, with few and short rounded warts, are also present. In addition there are a number of very irregular small bodies, which at times may be three-rayed or four-rayed. In stalk cœnenchyma the sclerites are spindles up to 5 mm long and 0.04 mm wide with pointed ends.

SINULARIA POLYDACTYLA (Ehrenberg) var. DIALICHANA Kolonko.

S. p. var. *dialichana* KOLONKO, Mitteil. Zoöl. Mus. Berlin 12 (1926) 325, pl. 4, fig. 3.

Colony with an almost smooth sterile stalk which is slightly enlarged towards the base as well as towards the capitulum.

Capitulum composed of a number of primary branches that arise at an angle from the stalk. These give off slender secondary and tertiary fingerlike processes towards their ends. These processes oftentimes are entangled among each other and then diverge strongly from one another. The polyps are usually 1 to 1.5 mm apart. Besides the typical sclerites found in the typical species, there are in the cortex other plump clubs with strongly developed central warts, as well as numerous overdeveloped clublike forms. Other sclerites are similar to those of the typical species. The spindles with simple finely knobbed warts, found in the typical species, are very seldom seen in this variety.

SINULARIA POLYDACTYLA var. MOLLIS Kolonko.

S. p. var. *mollis* KOLONKO, Mitteil. Zoöl. Mus. Berlin 12 (1926) 325, pl. 4, figs. 4 and 5.

This differs from the typical species in being smaller and in having a less-branched capitulum and much fewer sclerites, which make the colony rather soft and flabby. The clubs of the cortex are stout, 0.12 to 0.2 mm long and 0.05 to 0.7 mm wide. The short processes close under the central wart are usually broad. In stalk cœnenchyma only spindles with simple, finely knobbed warts are present. They are slender, usually 5 mm long.

SINULARIA MACRODACTYLA Kolonko. Plate 2, fig. 9.

Sinularia macrodactyla KOLONKO, Mitteil. Zoöl. Mus. Berlin 12 (1926) 328, pl. 3, fig. 4.

Colony low or encrusting or wide with large, wide, and flat but pointed lobes from the disc. Basal line present. Polyps confined to disc. Cortical clubs are stout, almost pointed, with many warts arranged bushlike at head. Club head unbranched and without a central wart.

Colony low and wide or encrusting with a short stalk with a sharp line between the calcareous base and the rest of the stalk. Disc separated from the stalk by a rimlike boundary. Disc with large lobes that are divided into nearly triangular, flat, pointed, and diagonally inclined processes. Polyps confined to disc. They are large and very prominent, about 1 to 2 mm apart on the lobes and at the external surface of the disc. At center of discs they may be farther apart. Clubs of cortex are 0.08 to 0.15 mm long and 0.04 to 0.07 mm wide at the head. They

are stout, with prominent, pointed, or rounded warts clustered around the head. Club stalk usually more or less pointed. In addition to the clubs, large spindles with irregular warts and spindlelike slender sticks also with few warts are present in the cortex. Sclerites of stalk interior are large spindles reaching 4 mm long and over 1 mm thick with thickly set prominent warts.

Colony of medium size, the one described by Kolonko was 12 by 17 cm wide and 2 to 4 cm high.

Reported only from Puerto Galera, Mindoro, Philippines.

Genus ALCYONIUM Linnæus

Alcyonium LINNÆUS, Systema Naturæ ed. 10 1 (1758) 803.
Alcyonium LAMARCK, Hist. Nat. d. Anim. s. Vert. 2 (1816) 388.
Alcyonium QUOY and GAIMARD, Voyage de l' Astrolabe 4 (1833) 269.
Alcyonium DANA, Zoophytes. Philadelphia (1846) 611.
Alcyonium MILNE-EDWARDS, Hist. Nat. d. Cor. 1 (1857) 114.
Alcyonium GRAY, Ann. & Mag. Nat. Hist. IV 3 (1869) 121.
Alcyonium KLUNZINGER, Die Koralltiere des Roten Meeres 1 (1877) S. 21.
Alcyonium WRIGHT and STUDER, Challenger Report 31 (1889) 238.
Alcyonium MAY, Jena. Zeitschr. f. Naturw. 33 (1899) 102.

The genus *Alcyonium* was established by Linnæus in 1758. Of the three species that he included under the genus, only one, *A. digitatum*, really belongs there. Pallas (1768) enumerated twelve species under the genus, but only a few of these actually belong to it. Lamarck (1816) included forty species under it, but these are almost all sponges, and the three forms which he should have included under the genus were placed by him under another genus, *Lobularia*. In a revision of all previously described species, Milne-Edwards (1857) placed all species of *Lobularia* under the old genus *Alcyonium* and enumerated a total of sixteen species. In 1889, Wright and Studer again revived the genus *Lobularia*. But as there are no true differences by which this can be separated from *Alcyonium*, the name *Lobularia* has been suppressed ever since.

Members of the genus *Alcyonium* are Alcyoniidæ whose colonies are either massive, with a stalk and a disc divided into lobes, or encrusting, or columnar and unbranched. The polyps have no dimorphism. They are located on the outer surface of the colony and are completely retractile. The canal system is very irregular in extent and shows no division into inner and outer parts.

Alcyonium can easily be distinguished from *Sinularia* to which it is closest in external appearance, by the presence of the dumb-bell-shaped sclerites in the cœnenchymal walls and by the smaller size of the stalk sclerites. In *Sinularia* the stalk sclerites are very large, up to 1 cm long. In *Alcyonium* the sclerites are always less than 2 mm long.

Kükenthal (1906) has divided *Alcyonium* into three subgenera; namely, *Erythropodium, Metalcyonium,* and *Alcyonium.* In 1912, Broch changed the name of the subgenus *Alcyonium* to *Eualcyonium. Eualcyonium* is the typical *Alcyonium;* that is, with a massive upright stalk and a capitulum more or less divided into many or few processes. *Metalcyonium* includes all forms that are unbranched and cylindrical or club-shaped, while *Erythropodium* includes all encrusting, membranous forms. *Metalcyonium* is confined to the subantarctic region (Patogonia and South Africa), while *Erythropodium* has been reported only from northern seas, the Atlantic, Mediterranean, and Red Seas and the West Indies. *Eualcyonium* is found in practically all waters. All together there are about nineteen valid species under this subgenus; but only three of these have been reported from the Philippines.

Key to the species of the subgenus Eualcyonium.

a^1. Cœnenchymal sclerites, in addition to others, are dumb-bell-shaped double cylinders, spheres, or discs.
  b^1. Cœnenchymal sclerites typical dumb-bells.
    c^1. Cortical sclerites double spheres with short neck.
      A. globuliferum Klunzinger.
    c^2. Cortical sclerites biscuit-form.
      d^1. Twigs of capitulum small and round.
        e^1. Twigs closely set, flattened against each other; colony brain-like in appearance ..... *A. sphaeropthorum* (Ehrenberg).
        e^2. Twigs far apart and higher..... *A. digitulatum* Klunzinger.
      d^2. Twigs large and fingerlike.
        e^1. Cœnenchymal sclerites with short thick neck.
          A. pachyclados Klunzinger.
        e^2. Cœnenchymal sclerites with long neck and small thorns on either end ..... *A. brachyclados* (Ehrenberg).
  b^2. Cœnenchymal sclerites are slender spindles and sticks or with irregular four-rayed or eight-rayed forms.
    c^1. Simple clubs present in cœnenchyma.
      d^1. Colony with a distinct stalk.
        A. etheridgei Thomson and Mackinnon.
      d^2. Colony without a distinct stalk.
        e^1. Cœnenchymal sclerites, in addition to clubs, are double spheres with slight constrictions.

f^1. Cœnenchymal sclerites include thorny spindles.
A. paessleri May.
f^2. Cœnenchymal sclerites have no thorny spindles.
A. fallax Lüttschwager.
e^2. Cœnenchymal sclerites only double spheres or dumb-bell forms with deep constriction; cortical sclerites are clubs.
A. ceylonensis May.
c^2. No clubs in cœnenchyma.
d^1. Cœnenchymal sclerites are cylindrical, slightly warty forms with weak constriction..... *A. equisetiforme* Lüttschwager.
d^2. Cœnenchymal sclerites are disclike or warty oval forms.
e^1. Disclike sclerites covered with inconspicuous warts.
A. fauri Thomson.
e^2. Disclike sclerites covered with high warts.
A. valdiviae Kükenthal.
a^2. Cœnenchymal sclerites include no dumb-bell-like forms.
b^1. Sclerites thick, strongly warted spindles.... *A. gracillimum* Kükenthal.
b^2. Sclerites slender spindles and rods, or irregular in form or eight-rayed.
c^1. Colony with slender sterile stalk with slender branches.
d^1. Colony translucent, polyps large and hyaline.
A. palmatum Pallas.
d^2. Colony slightly transparent, polyps large.
A adriaticum Kükenthal.
d^3. Colony slightly transparent, polyps small, yellow.
A. brioniense Kükenthal.
c^2. Colony with short, thick, fleshy branches.
d^1. Branches slender and pointed distally.... *A. glomeratum* Hassall.
d^2. Branches blunt, thick, and rounded.
e^1. Polyps deep red..... *A. compressum* Studer.
e^2. Polyps light, hyaline..... *A. digitatum* Linnæus.

ALCYONIUM PACHYCLADOS Klunzinger.

A. pachyclados KLUNZINGER, Korralthiere des Roten Meeres 1 (1877) 24, pl. 1, fig. 5.

Colony more or less fleshy and soft. It has a very short stalk, oftentimes very insignificant, attached to the substratum by a narrower basal portion. The stalk broadens abruptly to form a capitulum composed of a number of processes. The processes are mostly thick, even, stumpy, broad and fingerlike, usually longer than broad. They are usually 3 to 5 mm long, far apart, and hardly touching each other. Polyps may be fully extended or retracted. Cortical sclerites of the stalk are elliptical or 8-shaped discs and larger cylindrical forms, 0.04 to 0.05 mm long and 0.02 mm wide, with few warts. In the stalk cœnenchyma are large dumb-bell-shaped sclerites or double spindles with a middle portion free from warts. In general the neck is not much smaller than the two. At both ends are

numerous rugged irregular warts. These sclerites are 0.08 to 0.1 mm long and 0.06 mm wide with a neck about 0.005 to 0.012 mm long.

Color in alcohol white to brown.

Reported from various parts of the Indo-Pacific region.

ALCYONIUM DIGITULATUM Klunzinger.

A. digitulatum KLUNZINGER, Korralthiere des Roten Meeres 1 (1877) 24, pl. 1, fig. 3.

Colony with a leathery consistence and a short stalk that divides into a number of lobes. These in turn give off on their inner sides several smaller lobes which are usually short and fingerlike. They are usually as long as broad and are not very thickly crowded. Usually the polyps are not fully retracted so that the entire colony appears woolly. Cortical sclerites of the stalk are long-oval elliptical discs reaching 0.05 mm long and 0.016 mm wide, with or without any clear neck, and usually without a definite indentation. The cœnenchymal sclerites of the disc are double spindles with a long handle not much diminished in size and few large warts on either end. The sclerites of the stalk cœnenchymal wall are double spindles 0.07 to 0.08 mm long and 0.06 mm wide with a short narrow neck and greatly enlarged ends.

The Philippine form (C–2211) has a total height of 60 mm and a polypary expanse of 65 mm. Color in alcohol is grayish white, polyps darker.

Reported from the Red Sea and Zanzibar. Philippine material obtained from Batas Island, Palawan.

This form differs from *A. sphaerophorum* in having the lobes not closely crowded and flattened against each other. The colony cannot be called hemispherical in shape as is the case with *A. sphaerophorum*.

ALCYONIUM EQUISETIFORME Lüttschwager.

A. paessleri MAY, Alcyon. Ergeb. Hamburg. Magulh. Sammelreise (1899).

A. equisetiforme LÜTTSCHWAGER, Philip. Journ. Sci. 20 (1922) 525.

Colony composed of a thick rounded stem that gives off a number of main branches. These in turn divide to form several rounded, fingerlike, pointed processes that are about 3 cm long. The long thick stem together with the strong branching on the upper portion gives a treelike impression in which the stem can be well distinguished with an upper crown. Polyps

present both on the branches and the upper portion of the stem. The sclerites are principally confined to the stem. Sclerites of stalk cœnenchyma are irregular cylinders, mostly 0.1 to 0.2 mm long and 0.06 mm wide, with more or less pointed ends with weak constriction at middle and very thickly warted. In the cœnenchyma of the branches there are few small sticks. The colony is hard and stiff below but rather soft and flabby at the upper parts.

Color in alcohol yellowish to brown.

Previously reported from Franklin Island. Philippine material obtained from Puerto Galera Bay, Mindoro.

Genus LOBOPHYTUM Marenzeller

Lobophytum MARENZELLER, Zool. Jahrb. Syst. 1 (1886) 341.
Lobophytum WRIGHT and STUDER, Challenger Report, Zool. 31 (1889) 250.
Lobophytum MAY, Mitteil. Mus. Hamburg. 15 (1898) 28.
Lobophytum PRATT, Alcyon. Maldives (1903) 514.
Lobophytum KÜKENTHAL, Abh. Mayer, Ak. 2 Suppl. Bd. 1 (1906) 20.
Lobophytum LÜTTSCHWAGER, Arch. Naturg. A Heft 10 (1914) 27.
Lobophytum J. MOSER, Mitteil. Mus. Berlin 9 (1919) 257.

The genus *Lobophytum*, with three species, was established by Marenzeller in 1886. Seventeen others species have been described as belonging to this genus. Six of the species do not belong to the genus. J. Moser (1919) examining recently collected material from the Philippines and other material in the Berlin Museum found three new species, bringing the total number of valid species and varieties of the genus to seventeen. Four of these are not encountered in the Philippines.

The members of the genus can be distinguished from other genera of the family Alcyoniidæ by the use of the following diagnosis: The disc, which is sharply delimited from the stalk by a distinct boundary, has a surface thrown up into lobes or fingerlike processes that are closed except for a slight triangular indentation at the base of those situated peripherally. The polyps are confined to the disc and its processes. These are small, closely set, fully retractile and with dimorphism. Sex cells are found only in the autozooids. Stomodeal walls wholly or almost entirely free of sclerites. Endodermal canal net not differentiated into an outer and inner part. The warts of the cœnenchymal sclerites are strongly inclined to form girdles.

To make the classification utilized in this section clear, I am showing here the systematic relationships of all species and

varieties heretofore described as belonging to the genus *Lobophytum*.

1. LOBOPHYTUM SARCOPHYTOIDES J. Moser.
2. LOBOPHYTUM BATARUM J. Moser.
3. LOBOPHYTUM SCHOEDEI J. Moser.
4. LOBOPHYTUM CREBRIPLICATUM Marenzeller.
5. LOBOPHYTUM CREBRIPLICATUM var. CRASSOSPICULATUM J. Moser.
   Lobophytum crassum var. *sansibaricum* May (part.).
6. LOBOPHYTUM GAZELLAE J. Moser.
   Lobophytum glaucum Th. Studer non Quoy and Gaimard.
7. LOBOPHYTUM ROXASI J. Moser MS.
8. LOBOPHYTUM CRASSUM Marenzeller.
   Lobophytum pauciflorum Pratt non Ehrenberg.
   Lobophytum crassum var. *australicum* May.
   Lobophytum crassum var. *proliferum* Marenzeller.
   Lobophytum crassum var. *sansibaricum* May (part.).
   Lobophytum murale (Dana).
   Lobophytum crassum var. *crista-galli* Marenzeller.
9. LOBOPHYTUM CRASSUM var. BORBONICUM Marenzeller.
10. LOBOPHYTUM HEDLEYI Whitelegge.
11. LOBOPHYTUM LIGHTI J. Moser.
12. LOBOPHYTUM PAUCIFLORUM (Ehrenberg).
    Lobophytum candelabrum Roule.
    Lobophytum madreporoides Ridley.
    Lobophytum rigidum May non Dana.
    Lobophytum submurale (Ridley).
    Lobophytum pauciflorum var. *validum* Marenzeller.
13. LOBOPHYTUM PAUCIFLORUM var. PHILIPPINENSE J. Moser.

Key to the species of the genus Lobophytum Marenzeller.

a^1. Stalk sclerites never with cylindrical or barrel-shaped forms.
  b^1. Folds and lobes not prominent, found only on disc periphery. *L. sarcophytoides* J. Moser.
  b^2. Disc fully covered with lobes..... *L. batarum* J. Moser.
a^2. Among basal stalk sclerites are cylindrical and barrel-like forms.
  b^1. Disc outer surface only with shallow corrugated lobes, not fingerlike processes.
    c^1. Colony low and broad.
      d^1. Lobes only on periphery..... *L. schoedei* J. Moser.
      d^2. Disc fully covered all over by lobes.
        e^1. Sclerites of stalk basis over 0.25 mm long. *L. crebriplicatum* Marenzeller.
        e^2. Sclerites of stalk basis less than 0.25 mm long. *L. crebriplicatum* var. *crassospiculatum* J. Moser.
    c^2. Colony slender and rather high..... *L. gazellae* J. Moser.
  b^2. Disc outer surface with lobes cleft into fingerlike processes.
    c^1. Lobes not cleft up to base such that disc may be partly covered with lobes and partly by fingerlike processes.

d^1. Lobes irregularly cleft.
e^1. Stalk base has spindles in addition to cylinders and barrels.
L. roxasi J. Moser.
e^2. Stalk without any spindlelike sclerites.
f^1. Disc sclerites more than 0.26 mm long.
L. crassum Marenzeller.
f^2. Disc sclerites at most 0.26 mm long.
L. crassum var. *borbonicum* Marenzeller.
d^2. Lobes very regularly cleft.
e^1. Lobes numerous, radially arranged, each with more than two processes ..... *L. hedleyi* Whitelegge.
e^2. Lobes few, radially flattened, broad at ends and with processes.
L. lighti J. Moser.
c^2. Lobes cleft up to base into fingerlike process.
d^1. Sclerites of stalk base over 0.22 mm long.
L. pauciflorum (Ehrenberg).
d^2. Sclerites of stalk base less than 0.22 mm long.
L. pauciflorum var. *philippinense* J. Moser.

LOBOPHYTUM SARCOPHYTOIDES J. Moser.

L. sarcophytoides J. MOSER, Mitteil. Zool. Mus. Berlin 9 (1919) 267, fig. 13, pl. 6, fig. 16.

Disc provided with oak-leaf-like folds and lobes at periphery which may be fingerlike processes at middle. Autozooids small, closely set, with one row of siphonozooids between them. Stalk sclerites are sticks and spindles about 0.33 mm long 0.09 mm wide, with three to eight whorls of high warts.

Stalk slightly widened apically. Disc with numerous folds and lobes resembling oak leaves. Autozooids small, inconspicuous and closely set with only one row of siphonozooids between two of them at upper parts of lobes. Siphonozooids very small and almost invisible to naked eye. Sclerites of disc cortex are pointed spindles, 0.07 to 0.09 mm long with two rows of few low warts, and clubs about 0.1 mm long with warty heads. In stalk cortex are small clubs 0.11 mm long with warts better differentiated than in disc cortex clubs. In disc interior are spindles and sticks 0.25 to 0.38 mm long and 0.06 mm wide with widely separate low warts that are distinctly arranged in whorls. In stalk cœnenchyma are spindles on the average 0.25 mm long and 0.08 mm wide, covered with large or small warts arranged in more or less definite girdles. Few sticks reaching 0.38 mm long and 0.06 mm wide with less-differentiated warts are also present. Some stalk sclerites are sometimes curved or otherwise deformed.

Colonies large, largest known has disc 17 cm in diameter.

Reported only from the Philippines.

LOBOPHYTUM BATARUM J. Moser.

L. batarum J. MOSER, Mitteil. Zool. Mus. Berlin 9 (1919) 268, fig. 14; pl. 6, fig. 13.

Disc fully covered with numerous, radially directed, flattened, but high lobes that may often be divided. Autozooids small and extraordinarily closely set. Siphonozooids small. Stalk sclerites are long spindles, up to 0.52 mm long, with as many as nine whorls of warts.

Stalk high and conical. Disc fully covered with small, high, radially directed lobes. These are either undivided, corrugated, or divided into fingerlike processes whose cross sections are never circular. Only one row of small inconspicuous siphonozooids between two autozooids. Cortical sclerites are simple sticks and spindles 0.05 to 0.2 mm long, and clubs with warty heads which in stalk cortex are 0.12 mm long on the average. In disc cœnenchyma are simple sticks reaching 0.45 mm long with high undifferentiated warts. In stalk interior are spindles, on the average 0.4 mm long, whose slightly differentiated warts are arranged visibly into as many as ten whorls. Basal part of stalk full of similar but more-massive spindles that may reach a length of 0.5 mm.

Colonies large; the largest known has the disc 16 cm in diameter.

Reported only from the Philippines.

LOBOPHYTUM SCHOEDEI J. Moser.

Lobophytum schoedei J. MOSER, Mitteil. Zool. Mus. Berlin 9 (1919) 276, fig. 18; pl. 6, fig. 14.

Disc carries numerous, high, small, often corrugated, slightly differentiated lobes which extend from periphery towards center. Autozooids and siphonozooids small and very closely set. Sclerites of stalk interior are massive spindles and barrels about 0.3 mm long with six indistinct whorls of warts. Disc has cylindrical sclerites as long as 0.2 mm, approaching the appearance of spindles, and dumb-bell-shaped barrels with well-differentiated ends.

Reported from Bougainville; a non-Philippine species.

LOBOPHYTUM CREBRIPLICATUM Marenzeller.

Lobophytum crebriplicatum MARENZELLER, Zool. Jahrb. Syst. 1 (1886) 362, pl. 9, fig. 7.

Disc fully covered with low or high folds, about 5 mm thick, extending radially and whose apices are fully or partially folded,

which especially towards center of disc may give rise to conical processes. Autozooids far apart, about 2 mm from each other. Siphonozooids small, but not very closely set, and not deep-set. Disc cortical sclerites 0.2 to 0.24 mm long. Sclerites of disc interior are slender spindles 0.25 mm to 0.35 mm long and 0.05 to 0.07 mm wide with small warts. Sclerites of stalk cortex are small clubs. Those in stalk interior are warty spindles about 0.25 mm long and 0.07 to 0.08 mm wide.

Known only from Tonga Island; a non-Philippine species.

LOBOPHYTUM CREBRIPLICATUM var. CRASSOSPICULATUM J. Moser.

L. crebriplicatum MARENZELLER, Zool. Jahrb. Syst. 1 (1886) 362, pl. 9, fig. 7.

Disc fully covered with low lobes which may reach its center. Autozooids 1 to 2 mm apart. Siphonozooids in two rows between two autozooids. Stalk sclerites barrel-shaped or cylinders on the average 0.17 mm long and 0.1 mm wide with four distinct whorls of warts. Differs from typical species in having much smaller stalk sclerites.

Stalk carries a thick disc which is divided into low, stout, radially arranged, thickly set lobes which reach center. Top of lobes may be partly or fully divided and can give rise to conical processes at their central part. Autozooids tiny but distinct. On lobes there are usually two of them between two autozooids. Sclerites of disc cortex are thick spindles 0.12 to 0.19 mm long, with two whorls of small, undifferentiated warts, and clubs as long as 0.13 mm long with a warty head and a tiny wart ring at pointed end. In disc cœnenchyma are spindles on the average 0.27 mm long and as wide as 0.075 mm, and barrels about 0.21 mm long and almost 0.075 mm wide with closely set warts. Sclerites of stalk interior are barrels and cylinders 0.16 to 0.21 mm long and up to 0.12 mm wide with four wide whorls of warts. Few spindles about 0.32 mm long and 0.09 mm wide and oftentimes slightly bent are also found.

Colonies small, largest known has disc 9 cm in diameter.

Reported from Puerto Galera Bay, Mindoro, Philippines, and Zanzibar.

LOBOPHYTUM GAZELLAE J. Moser.

Sarcophytum glaucum STUDER, Monatsb. Ak. Wiss. Berlin (1878) 634.

Disc has several thick, high, but poorly differentiated lobes extending up to center, on which small closely set autozooids are found. Siphonozooids very small and indistinct. Stalk

sclerites are slender spindles, 0.25 mm long with six to eight whorls of warts, and cylinders on the average 0.2 mm long with four whorls of warts. Disc sclerites are spindles as long as 0.43 mm.

Disc distinctly delimited from cylindrical stalk. It has high, radially directed, massive, oftentimes waved, lobes. Autozooids small, closely set, there being about ten in a centimeter. Siphonozooids very small and indistinct. At apices of lobes there are two to three of them between two autozooids. Disc cortex with poorly differentiated sticks 0.05 to 0.3 mm long, and clubs on the average 0.16 mm long. Stalk cortex sclerites more massive and more differentiated, about 0.13 mm long and 0.06 mm wide. In disc cœnenchyma are massive spindles, clubs, and slender sticks, from 0.25 to 0.4 mm long. Stalk interior contains simple barrels about 0.15 mm long, well-differentiated massive barrels on the average 0.21 mm long with four distinct whorls of warts, and slender spindles as long as 0.3 mm with six to eight whorls of warts.

Colonies small, usually 3 cm in diameter.

Formerly known only from New Ireland. New material was obtained recently from Puerto Galera Bay, Mindoro, Philippines.

LOBOPHYTUM ROXASI J. Moser MS.

Disc with laterally flattened fingerlike lobes not regularly cleft up to bases. Lobes present on periphery as well as center of disc. Autozooids small, about 1 to 1.5 mm apart with two to three rows of very tiny siphonozooids between them. Stalk sclerites spindles as well as short stumpy barrels.

The colony has a short sterile stalk, marked with few irregular longitudinal lines on one side, from which the disc extends out peripherally only for a short distance. Disc composed of a periphery sharply delimited from the stalk, and six to eight lobes which are usually flattened radially. Four or five of these are peripheral and two or more are median. Autozooids small, and at the apices of lobes they are 1 to 1.5 mm apart with two to three rows of very tiny siphonozooids between them. Disc cortex is provided with small, almost smooth, pointed sticks about 0.14 mm long and 0.011 mm wide. Stalk cortex with small sticks similar to those of the disc but with few conical warts. Disc cœnenchyma provided with slender simple spindles, at most 0.37 mm long and 0.056 mm wide, with low truncated warts which at times are arranged to form about eight girdles.

In stalk cœnenchyma are similar spindles, at most 0.37 mm long and 0.056 mm wide, in addition to numerous short stout barrels about 0.2 mm long and 0.098 mm wide with about four more or less definite whorls of large warts. In addition there are a few almost spherical sclerites about 0.12 mm in diameter with irregular warts.

Moser's type in the Berlin Museum is a small colony with a stalk 18 mm high and 25 mm in largest diameter, and a disc 25 mm high and a large diameter of 40 mm. Its spiculation is similar to that of *L. gazellae,* although other characters are entirely different.

Locality: The exact Philippine locality is unknown.

LOBOPHYTUM CRASSUM Marenzeller.

Lobophytum crassum MARENZELLER, Zool. Jahrb. Syst. 1 (1886) 363.
Lobophytum crassum var. *crista-galli* MOSER, Mitteil. Zool. Mus. Berlin 9 (1919) 286, fig. 2–3.

Disc with rough, loose, irregularly cleft lobes. Autozooids small, hardly visible. Siphonozooids numerous but small. Stalk sclerites are barrels 0.17 to 0.2 mm long and as much as 0.1 mm wide with two to four whorls of warts. Cœnenchymal sclerites are spindles, 0.28 mm long on the average with distinct warts in girdles.

Stalk carries a large, rough disc with numerous closely set lobes. Edge of lobes may be deeply indented or only slightly roughened. Fingerlike processes are also not infrequent on periphery of disc. Autozooid and siphonozooids small, but visible. Sclerites of disc cortex slender, poorly differentiated spindles reaching 0.13 mm long with two widely separate whorls of low warts. In disc cœnenchyma, sclerites are stout spindles, oftentimes bent, 0.25 mm to 0.35 mm long and as much as 0.08 mm wide. In deeper portions of disc are cylinders 0.2 to 0.24 mm long and 0.1 mm wide. Warts are always in distinct whorls. In stalk cortex are sclerites similar to those in disc cortex although slightly longer and more differentiated. Besides, small clubs as long as 0.15 mm are also seen. Stalk interior has barrel-shaped sclerites on the average 0.17 mm long and almost half as wide with two to four whorls of tall warts.

Colonies very large; may measure as much as 100 cm in disc diameter.

Known from Reunion Island, Port Denison, Tonga Island, Mauritius, Loyalty Island, Pedro Shoal, Prasslin, Northeast Australia, Tamataves, East Africa, Zanzibar, and the Philippines.

LOBOPHYTUM CRASSUM var. BORBONICUM Marenzeller.

Lobophytum crassum var. *borbonicum* MARENZELLER, Zool. Jahrb. 1 (1886) 364.

This variety differs from the typical species in having shorter disc sclerites that never grow longer than 0.26 mm and in having stalk sclerites more or less like blackberries in shape.

The example from the Philippines was obtained from Taytay Bay and has a dimension of 16 cm high and 10 to 12 cm in diameter. This variety has also been reported from Reunion Island.

Lobophytum crassum var. *crista-galli* Marenz. should be included under the typical species.

LOBOPHYTUM HEDLEYI Whitelegge.

Lobophytum hedleyi WHITELEGGE, Mem. Austr. Mus. (1897) 217, pl. 10, fig. 2*a–b*.

Disc with high lobes divided into uniform fingerlike processes. Autozooids sparse; on top of lobes they are 1 to 2 mm apart. Stalk sclerites as large as 0.2 mm long and 0.1 mm wide.

Stalk carries a disc covered with seemingly high folds, which may still be divided into fingerlike processes. Autozooids not numerous, at upper portions of lobes they are 1 to 2 mm apart. Siphonozooids numerous and lie deep. Sclerites of disc cortex are small spindles about 0.11 mm long with widely separate whorls of small low warts. In stalk cortex are also spindles of stronger build about 0.13 mm long with as many as three whorls of small warts and with warty head. In disc interior are spindles 0.3 mm long with girdles of medium-size warts. Sclerites of stalk interior are stout spindles or barrels about 0.17 mm long and 0.1 mm wide. They always have four whorls of warts, the two median always being more prominent than the two terminal.

Colonies large, measuring as much as 50 cm in diameter.

Reported from Funafuti, Ceylon, Amboina, New Ireland, and the Philippines.

LOBOPHYTUM LIGHTI J. Moser.

Lobophytum lighti J. MOSER, Mitteil. Zool. Mus. Berlin 9 (1919).

Lobes of disc, which are two-pointed apically, become smaller and stalklike basally. Autozooids about 1 mm apart. Siphonozooids are not very small, deeply set, yet visible. Stalk sclerites are barrel-shaped and cylindrical 0.2 to 0.26 mm long and as wide as 0.14 mm, with two to four whorls of warts. Upper stalk has in addition sticks and spindles 0.2 to 0.5 mm long with well-developed warting.

Disc with flat, high lobes arranged tangentially with bases stalklike. Lobes, as a result of rounded invagination, become divided into two points which form either an acute or right angle with each other. Autozooids small, 1 to 5 mm apart. When expanded they are about 3 mm long. Siphonozooids large and prominent, closely set but not deep. Sclerites of disc cortex simple spindles about 0.11 mm long with two whorls of low undifferentiated warts. Disc cœnenchyma sclerites are spindles and clubs 0.25 to 0.38 mm long with many indistinct whorls of differentiated warts. Sclerites of upper stalk cortex are similar to those in the disc cortex. They are as long as 0.2 mm. At lower levels of stalk, cortical sclerites are massive spindles about 0.2 mm long or longer, with two to four whorls of warts. In stalk interior there are two kinds of skeletal formation. In the upper parts are slender sticks and spindles 0.5 mm long. The longer the sclerites, the less differentiated are the warts. In stalk base are cylindrical sclerites 0.25 mm long and as wide as 0.14 mm with prominent, rich, warting. The ends may be pointed or blunt. Besides, numerous spindles, almost as long but visibly narrower, with numerous well-developed warts in widely separate and distinct whorls, are also present.

Colonies not large; the one described by Moser has a diameter of 6.5 cm.

Reported only from the Philippines.

LOBOPHYTUM PAUCIFLORUM (Ehrenberg).

Lobularia pauciflorum EHRENBERG, Corallth. Roten Meeres (1834) 58.

Disc with separate processes usually divided up to their base. Autozooids about 2 mm apart. Siphonozooids tiny and thickly set. Stalk sclerites elongate barrels 0.2 to 0.26 mm long and up to 0.09 mm wide, with two to four whorls of warts. Disc sclerites are warted sticks and spindles 0.4 mm long and 0.1 mm wide.

Processes on disc fingerlike, separate and divided down to their bases. Besides, there are also some short, compressed, but separate lobes. Openings of autozooids large, about 2 mm apart on the processes. Siphonozooids small but visible, about five between two autozooids. Cortical sclerites of disc simple spindles about 0.12 mm long. In disc interior are slender spindles usually 0.28 mm, but sometimes 0.4 mm long, and at most 0.1 mm wide, richly covered with girdles of high warts. Sclerites of stalk cortex are similar to those of disc cortex but slightly

longer and stronger in build. In stalk interior are barrel-shaped sclerites 0.22 to 0.26 mm long with four to six distinct rings of large warts.

Colonies usually large with disc reaching 30 cm in diameter.

Reported from Red Sea, Talili Bay, Andaman Island, Tonga, New Britain, Amboina, New Zealand, Moluccas, Funafuti, Maldives, Celebes, Wright Bank, and Philippines.

LOBOPHYTUM PAUCIFLORUM var. PHILIPPINENSE J. Moser.

Lobophytum pauciflorum var. *philippinensis* J. MOSER, Mitteil. Zool. Mus. Berlin 9 (1919) 281, fig. 21.

In this variety, the few deep divisions of fingerlike processes of disc are absent, so that lobes are visible here and there. This form has much smaller stalk sclerites than the typical species, reaching only a maximum length of 0.22 mm.

Disc covered with rounded fingerlike processes, which arise partly from seemingly high, radially arranged lobes. Autozooids large and black. Size and distance of siphonozooids similar to typical species. Sclerites of cortex as in typical form. In disc cortex are thickly warted spindles 0.24 mm long on the average, which may be at times more heavily warted on one side, making the sclerites appear cylindrical on this side. Wart whorls not distinct. In stalk cœnenchyma are barrels and cylinders 0.14 to 0.21 mm long and not quite half as wide, with four or more distinct whorls of warts. Usually they are pointed at both ends. Sometimes spindles up to 0.35 mm long with numerous warts are also seen.

Colonies not large, the largest known has the disc 8 cm in diameter.

Known only from Red Sea and Palawan, Philippines. *Lobophytum pauciflorum* var. *validum* Marenzeller should be included with the typical species.

Genus SARCOPHYTON Lesson emend. Marenzeller

Sarcophyton Lesson, BELANGER, Voy. Ind. Orient. Zool. Zooph. (1834) 517; DUBERREY, Voy. Coquille, Zool. 1830–38, II, Zooph. (1834) 92.

Sarcophytum MARENZELLER, Zool. Jahrb. Syst. 1 (1886) 341.

Sarcophytum KÜKENTHAL, Alcyon., Michaelsen u. Hartmeyer, Fauna Sudwest-Austral. 1 (1910) 6.

Sarcophytum KÜKENTHAL, Alcyon. Aru-Keiinseln, II. Merton, Erg. Zool. Forschungsreise in d. s.-o. Molukken, Erg. Senckenb Ges. 33 (1910) 309.

Sarcophyton J. MOSER, Mitteil. Zool. Mus. Berlin 9 (1919) 221.

The genus *Sarcophyton* was first established by Lesson in 1834 when he described an alcyonarian that he called *Sarcophyton lobulatum.* He was, however, unaware of the dimorphism of the polyps, and it was Kölliker (1867) who showed the existence of the nonsexual polyps. To the latter, Moseley (1880) gave the name "siphonozooids." The first comprehensive work on the genus was that of Marenzeller (1886) under the title "Über die *Sarcophytum* benannten Alcyoniiden." This work was much later improved upon by Kükenthal (1910) in his work on Alcyonaria of southwest Australia. The most recent and the most up-to-date treatise on the genus is that of Johannes Moser (1919), whose revision of the group grew out of the examination of alcyonarian material from the Philippines. Through his work much confusion was removed and now the group can easily be handled and studied even by workers who are not specialists. His paper was largely drawn upon in the preparation of this part of my work.

The genus *Sarcophyton* may, to a beginner, be mistaken for one of four other genera of the family Alcyoniidæ; namely, *Lobophytum, Sinularia, Alcyonium,* and *Anthomastus.* It can be easily distinguished, however, from *Lobophytum* by the fact that its folds or disc processes arise principally from the periphery. If lobes are present, they are laterally opened and are not as in *Lobophytum,* where the lobes or processes are entirely closed except for a slight, more or less triangular opening or indentation at the external sides of basal parts of lateral processes and where these processes are also found at the middle portions of the disc. Also in *Lobophytum* the warts of the sclerites have a greater tendency to form complete girdles or whorls, a phenomenon seldom seen in *Sarcophyton.* These two genera, however, are similar in having a distinct boundary line between the sterile stalk and the polyp-bearing disc or capitulum. *Sinularia* differs from *Sarcophyton* by the very long fingerlike processes of the disc and by the absence of a line of demarcation between the stalk and the distal portion of the colony. If a rimlike edge is present in *Sinularia* it does not separate the polyp-bearing portion of the colony from the sterile stalk. Members of the genus *Sinularia* always have very large stalk sclerites, usually longer than 2 mm. The genus *Alcyonium,* although very variable, can be recognized by the lack of siphonozooids, by the characteristic barrel-shaped sclerites (Doppelkeulen) in

the cœnenchyma, and by the characteristic growth of the disc. *Alcyonium* always has much smaller stalk sclerites than *Sinularia*. Finally in *Anthomastus* the disc is usually more or less spherical and it carries polyps on the upper as well as on the lower surface, and the gonads are found in the siphonozooids and not in the autozooids.

We shall, therefore, give the following diagnosis for the genus *Sarcophyton:*

Colony mushroom-shaped with the disc lobed or folded more or less strongly at margin, and set off distinctly from stalk. Polyps found only on outer disc surface; they are small, closely set, fully retractile, and dimorphic. Sex cells produced only in autozooids. Stomodeal wall almost or entirely free of sclerites. Endodermal canal net not differentiated into inner and outer parts. Cortical sclerites of disc and stalk are small clubs and short slender sticks. In disc cœnenchyma are longer, slender sticks and spindles more or less covered with warts. In stalk cœnenchyma are thin or very thick spindles, double spindles, or cylindrical sclerites covered with large warts.

In the latest work of Thomson and Dean, on the Alcyonacea of the Siboga Expedition, the authors reported having nine species of *Sarcophyton* in the collection, four of which were identified as new. Apparently these workers had not seen the work of J. Moser (1913). Upon examining their descriptions and illustrations, I found that their *S. trocheliophorum minus* n. var. is identical with *S. crassocaule* J. Moser, that *S. convolutum* Thomson and Dean is a form of *S. acutangulum*, and that *S. spongiosum* is the same as *S. latum* var. *voeltzkowi* J. Moser. As previously discussed by Moser, *S. gracile* of Burchardt is, of course, identical with *S. glaucum* (Quoy and Gaimard). *Sarcophyton tenuispiculatum* of Thomson and Dean appears to be a valid species if it is a *Sarcophyton*. The lone animal they described, however, is apparently young, and it is very probable that it is a young example of a *Lobophytum;* they based the determination on the spicules alone. If such is the case, then it is most probably identical with *Lobophytum sarcophytoides* J. Moser.

Those who have not seen Moser's paper on *Sarcophyton* can see in the following list where all previously described species and varieties of *Sarcophyton* rightly belong:

1. SARCOPHYTON LATUM (Dana).
2. SARCOPHYTON LATUM var. VOELTZKOWI J. Moser.
   Sarcophyton spongiosum Thomson and Dean.
3. SARCOPHYTON EHRENBERGI Marenzeller.
   Sarcophyton oligometra Pratt.
   Sarcophyton tenuis Pratt.
   Sarcophyton ehrenbergi var. *areolatum* Burchardt.
   Sarcophyton ehrenbergi var. *sansibaricum* May.
4. SARCOPHYTON EHRENBERGI var. STELLATUM Kükenthal.
5. SARCOPHYTON CRASSOCAULE J. Moser.
   Sarcophyton trocheliophorum var. *minus* Thomson and Dean.
6. SARCOPHYTON ACUTANGULUM (Marenzeller).
   Sarcophyton contortum Pratt.
   Sarcophyton roseum Pratt.
   Sarcophyton convolutum Thomson and Dean.
7. SARCOPHYTON PUERTO-GALERÆ Roxas.
8. SARCOPHYTON MOSERI Roxas.
9. SARCOPHYTON TROCHELIOPHORUM (Marenzeller).
   Sarcophyton dispersum Schenk.
   Sarcophyton pallidum Cohn.
   Sarcophyton pulmo Klunzinger.
   Sarcophyton reichenbachi Schenk.
   Sarcophyton viride (Thomson and Henderson).
   Sarcophyton trocheliophorum amboinense Marenzeller.
   Sarcophyton trocheliophorum var. *intermedium* Burchardt.
   Sarcophyton trocheliophorum var. *moluccanum* Schenk.
10. SARCOPHYTON DIGITATUM J. Moser.
11. SARCOPHYTON ELEGANS J. Moser.
12. SARCOPHYTON GLAUCUM (Quoy and Gaimard).
    Sarcophyton ambiguum Studer and Wright.
    Sarcophyton boettgeri Schenk.
    Sarcophyton flavum (Ruppell).
    Sarcophyton fungiforme Schenk.
    Sarcophyton gracile Burchardt.
    Sarcophyton mycetoides Gravier.
    Sarcophyton nigrum May.
    Sarcophyton philippinense Studer and Wright.
    Sarcophyton plicatum Schenk.
    Sarcophyton tongatabuense Studer and Wright.
    Sarcophyton glaucum var. *amboinense* Burchardt.
    Sarcophyton glaucum var. *pauperculum* Marenzeller.

Of the above valid species and varieties only two varieties (*S. latum* var. *voeltzkowi* and *S. ehrenbergi* var. *stellatum*) have not been reported from the Philippines. Two species, *S. digitatum* and *S. elegans*, have been reported only from the Philippines, and *S. crassocaule* of J. Moser was established primarily

from materials collected from Philippine waters. Thorpe (1928) recently described two forms of *Sarcophyton* as new varieties, *S. trocheliophorum* var. *australiensis* and *S. acutangulum* var. *occidentalis*. As these agree very closely with the typical species in habit and skeletal formation and differ from them only in a few minor details, it is probably best to allow these to remain in the type species and not establish new varieties. After a thorough study of the representatives of the genus *Sarcophyton*, I was compelled to add two new species to the twelve valid species of the genus; namely, *S. moseri* and *S. puerto-galeræ* (Roxas, 1932). Since then, I have found another new form, *S. tersum*, which is described here for the first time.

Key to the Philippine species of the genus Sarcophyton.

a^1. Disc not or only slightly projecting out of the upper portion of stalk.
  b^1. Stalk sclerites 0.4 mm or longer..... *S. latum* (Dana).
  b^2. Stalk sclerites less than 0.4 mm long.
    c^1. Disc thick, not or only slightly folded.
      d^1. Warts of sclerites weak and indistinct..... *S. tersum* sp. nov.
      d^2. Warts of sclerites prominent.
        e^1. Stalk sclerites sticks or spindles.... *S. ehrenbergi* Marenzeller.
        e^2. Stalk sclerites barrel-shaped or cylindrical or double stars.
          f^1. Autozooids very large and prominent.
            S. crassocaule J. Moser.
          f^2. Autozooids very small and inconspicuous.
            S. puerto-galeræ Roxas.
    c^2. Disc thin, with folds very prominent.
      d^1. Autozooids far apart; four to six siphonozooids between two of them; many secondary folds present.
        S. acutangulum (Marenzeller).
      d^2. Autozooids closely set; one to two siphonozooids between two of them; few secondary folds..... *S. moseri* Roxas.
a^2. Disc projecting far out of the stalk.
  b^1. Stalk sclerites double spindles and barrels.
    S. trocheliophorum (Marenzeller).
  b^2. Stalk sclerites sticks and spindles.
    c^1. Disc with regular peripheral folds.
      d^1. Marginal folds or lobes longer than broad.. *S. digitatum* J. Moser.
      d^2. Marginal lobes not longer than broad..... *S. elegans* J. Moser.
    c^2. Disc with irregular folds..... *S. glaucum* (Quoy and Gaimard).

SARCOPHYTON LATUM (Dana). Plate 1, fig. 1.

Alcyonium latum DANA, Zoophytes (1846) 623, pl. 58, figs.
Sarcophytum latum WHITELEGGE, Alcyon. Funafuti 1 (1897) 215.

Disc poorly differentiated, extending out only slightly if at all from a very wide funnel-shaped stalk. Only one row of

siphonozooids between the autozooids. Sclerites of stalk bases are spindles 0.4 mm long or longer.

Disc not or only folded at periphery and not or only slightly extending beyond circumference of stalk. Colony may be encrusting. Autozooids about 1 mm apart. Each is surrounded by a circle of ten siphonozooids and there is only one row of these between two autozooids. Sclerites of disc cortex are clubs about 0.13 mm long sparsely warted throughout their lengths, and spindles 0.08 to 0.25 mm long, often deformed with high but undifferentiated rounded warts. In disc interior sclerites are sticks and spindles over 0.4 mm long with warts less differentiated. In stalk cortex are clubs similar to those in cortex, in addition to spindles 0.5 mm long and over 0.1 mm thick, covered with big warts. Stalk interior full of similar but larger, stouter, and more-compact spindles which may reach 1 mm in length at base.

Colonies small; largest known has a disc diameter of 5 cm.

Reported from the Philippines, Madagascar, Australia, and Fiji Islands. Philippine material was obtained from Taytay Bay, Palawan.

SARCOPHYTON TERSUM sp. nov. Plate 1, fig. 2.

Disc thick, hardly projecting out of a very smooth stout stalk. Autozooids small, inconspicuous, with three to five tiny hardly visible siphonozooids between them. Stalk sclerites are weak-looking spindles with rounded ends and with low flat warts which may be arranged in definite whorls.

Disc thick and smooth, hardly exhibiting any folding and hardly projecting beyond the periphery of stalk. Stalk very smooth and slimy to touch, usually slightly tapering towards the point of attachment. Autozooids very small and inconspicuous, about 1 mm apart at center of disc. Siphonozooids very tiny, closely set, there being three to four of them between two autozooids. In cortex of disc are very weak-looking, flattened spindles 0.35 to 0.4 mm long and 0.04 mm wide, with very few, low, weak warts. In disc interior are slender, weak sticks 0.5 to 0.55 mm long and 0.04 to 0.07 mm wide which are almost devoid of warts. If these are present, they are low, widely separate, and weakly pointed. In stalk cortex are very weak sticks, about 0.25 mm long and 0.08 mm wide, nearly spindle-shaped but without definite wartings. In stalk cœnenchyma are stout spindles about 0.3 mm long and 0.1 mm wide with rounded ends and with low flat warts arranged in four to six definite whorls.

The shape of the colony approaches that of *S. crassocaule.* The weak warts arranged in whorls of the cœnenchymal sclerites and the smooth and slimy touch of the stalk and capitulum are, however, very characteristic of the species. Of all the species of *Sarcophyton,* this one possesses the least-developed warts on the sclerites.

This description is based on seven specimens (C–5003) all collected from Puerto Galera Bay, Mindoro. The largest is about 50 mm high, with a capitulum diameter of 55 mm and a stalk diameter of 40 mm. The smallest is 30 mm high with disc diameter of 32 mm and a stalk diameter of 20 mm. All, except the smallest, are sexually mature.

SARCOPHYTON EHRENBERGI Marenzeller. Plate 1, fig 3.

Sarcophytum ehrenbergi MARENZELLER, Zool. Jahrb. Syst. (1886) 356, pl. 9, figs. 3, 4.

Disc that does not extend out of the stalk level shows distinct folding at the periphery only. Center of disc cup-shaped. There are six to seven siphonozooids between two adjoining autozooids. The stalk sclerites are slender spindles and sticks about 0.25 mm long.

Disc cup-shaped and folded at the periphery, not projecting beyond the slightly constricted upper portion of stalk. Autozooids 1 to 1.5 mm apart; between two of them are three, small, inconspicuous siphonozooids. Sclerites of disc cortex are sticks 0.1 to 0.2 mm long with thorny heads. In interior of disc are slender sticks as long as 0.44 mm with high thorns and warts which may grow like horns. In addition, shorter but thicker spindles may be found. Sclerites of the stalk cortex are similar to those of the disc cortex although they are more massive. Stalk interior is full of spindles about 0.26 mm long with few, rough, coarse warts. Few spindles approaching cylinders found. Colonies not very large. Largest reported has a disc diameter of 12 cm.

Reported from the Red Sea, Maldives, Ceylon, Zanzibar, Philippines, Port Denison, Reunion, and Bismarck Archipelago. Philippine material obtained from Puerto Galera Bay, Mindoro.

SARCOPHYTON EHRENBERGI var. STELLATUM Kükenthal.

Sarcophytum ehrenbergi var. *stellatum* KÜKENTHAL, Alcyonaria, in Michaelsen and Hartmeyer, Fauna Sudwest-Austral. 3 (1910) 24.

This differs from the typical species in having nine to ten siphonozooids between two autozooids. The cortical sclerites

when seen from above appear star-shaped. Stalk sclerites are plates and double stars about 0.24 mm long.

Stalk short and slightly broadened apically. Disc thick, soft, and flat, thinner at periphery and not extending far out of stalk. It is folded into thick simple folds. Autozooids as high as 3 mm; thickly set at periphery, while at center they are 4 to 5 mm apart. Siphonozooids closely set, there being nine to ten between two autozooids. Sclerites of disc cortex are clubs, 0.09 to 0.12 mm long, with few processes. Few larger sparsely warted spindles are found among them. These spindles grow much longer and more slender in disc interior. They may be slightly arched and may reach a length of 0.24 mm. Mouths of siphonozooids appear wreathlike; they are full of perpendicular clubs and spindles, which appear as star-shaped sclerites about 0.03 mm in diameter with few, plump, rounded rays. In stalk interior are wide or narrow spindlelike sclerites 0.24 mm long covered with large irregularly placed warts.

Reported from the Aru Islands; non-Philippine.

SARCOPHYTON CRASSOCAULE J. Moser. Plate 1, fig. 4.

Sarcophyton crassocaule J. MOSER, Mitteil. Zool. Mus. Berlin 9 (1919) 243, fig. 6; pl. 5, fig. 10.

The disc, which is hardly folded, extends only slightly, if at all, over the general surface of the fat stalk. There are four to five siphonozooids between two autozooids. The stalk sclerites are cylinders and double spindles about 0.17 mm long. The warts are arranged in four incomplete girdles.

Disc not or hardly extending beyond stalk, only weakly folded, if at all, at periphery. Autozooids thickly set, about seven to ten for a distance of 1 cm. Siphonozooids small, five to six between two autozooids at center and only one to three at periphery. Sclerites of disc cortex simple spindles 0.07 to 0.18 mm long. Deformed and abnormal sclerites are present. In disc interior are spindles and sticks about 0.2 mm long whose warts are almost arranged into whorls mostly four in number. In stalk cortex are spindles and clubs 0.09 to 0.13 mm long, and barrels and double spindles about 0.17 mm long, whose weakly differentiated warts form two, sometimes four, whorls. Some malformed ones, among which are flat sclerites pointed at one end also present. Stalk cœnenchyma full of simple cylinders at most 0.2 mm long, and spindles of same length with four whorls of warts. Few, indefinite, spherical sclerites with undifferentiated warts also present. In stalk base are sclerites similar to

usual stalk sclerites but with well-differentiated and high warts arranged in whorls.

Colonies small; the largest known has a disc diameter of 9 cm.

Reported only from the Philippines, Liebliche Islands, and New Guinea. Philippine material from Palawan and Mindoro.

SARCOPHYTON PUERTO-GALERÆ Roxas. Plate 1, fig. 5.

Sarcophyton puerto-galerae ROXAS, Univ. Philip. Nat. Applied Sci. Bull. 4 No. 1 (1932) 78, figs. 1*a*–1*d*.

The disc, which projects only slightly from the short stalk, has few peripheral thick folds and one or two low shallow lobes directed centrally. There are two to five very small siphonozooids between two autozooids. The stalk sclerites are barrels and double spindles, about 0.2 mm long and 0.1 mm wide with four more or less definite whorls of warts.

Disc projects only slightly from stalk and has shallow low peripheral folds, two or three of which have a tendency to become lobes which are directed into center of disc. Stalk itself low and wide, about 1.5 cm high and 2.5 cm in greatest diameter. Primary folds of disc weakly or not divided into secondaries. Autozooids very small and far apart with two to five very small siphonozooids, almost obsolete, between two of them. Sclerites of disc cortex are small clubs 0.1 to 0.13 mm long and 0.02 mm wide with small irregular warts. In disc interior are slender spindles 0.2 to 0.42 mm long and 0.03 to 0.04 mm wide with irregularly placed, small, pointed warts. Stalk cortex provided with small clubs 0.14 to 0.27 mm long and 0.03 to 0.05 mm wide, also with fine, irregularly placed warts. Stalk interior with barrel-shaped sclerites or double spindles with four more or less definite whorls of warts. They are 0.16 to 0.23 mm long and 0.096 mm wide. In addition to barrels and double spindles are almost spherical undifferentiated sclerites with low rounded warts. They are 0.1 to 0.11 mm long and 0.1 to 0.13 mm wide. Spindles 0.28 to 0.4 mm long, provided with small pointed warts arranged into six to ten irregular girdles are also seen in the stalk.

Locality: Puerto Galera Bay, Mindoro, Philippines.

Type in the University of the Philippines zoölogical collection; cotype in the Zoölogical Museum, Berlin.

The only species with which this may be confused, through its external appearance, is *S. crassocaule*. It differs from the

latter, however, in having its disc more folded and projecting farther out of the stalk. In *S. crasssocaule* the disc shows no lobes with tendency to become central, and its zooids are very much larger and easily visible. In skeletal composition it approaches *S. trocheliophorum*, although this never exhibits the almost spherical sclerites found in the stalk.

Colonies are small, the largest known has a disc diameter of 5 cm.

SARCOPHYTON ACUTANGULUM (Marenzeller).

Sarcophytum ehrenbergi var. *acutangulum* MARENZELLER, Jahrb. Syst. 1 (1886) 357.

Sarcophytum roseum PRATT, Alcyon. Maldives 2 (1903) 512, pl. 29, figs. 10, 11.

Sarcophytum contortum PRATT, Alcyon., Ceylon Pearl Oyster Fish. Rep. Suppl. Rep. 19 (1905) 251, pl. 1, figs. 6, 7.

Sarcophytum acutangulum KÜKENTHAL, Alcyonaria in Michaelsen and Hartmeyer, Fauna Sudwest-Austral. 3 (1910) 25, pl. 2, figs. 10, 11.

Sarcophyton a. J. MOSER, Mitteil. Zool. Mus. Berlin 9 (1919) 244, fig. 7.

Sarcophytum a. var. *occidentalis* THORPE, Journ. Linnean Soc. 36 (1928) 502.

The disc, which projects only slightly from the stalk, is folded into primary and secondary high folds resembling an oak leaf. There are three to six siphonozooids between two autozooids. The stalk sclerites are sticks and spindles about 0.36 mm long with wart girdles.

Disc strongly and regularly folded and extends only slightly from a somewhat broadened stalk. Primary disc folds are again folded into secondaries so that folds have oak-leaf forms. Autozooids at center of disc about 4 mm apart, but at periphery they are so close that no siphonozooids are seen between them. At folds near center of disc there are four to six siphonozooids between two autozooids. Sclerites of disc cortex are clubs about 0.08 to 0.1 mm long. In disc interior are spindles 0.2 mm long and sticks 0.3 mm long whose warts are strongly arranged into whorls. In stalk cortex are clubs similar to those of disc cortex but slightly larger. Sclerites of stalk interior are sticks usually 0.33 mm long but reaching 0.45 mm, and spindles 0.3 mm long. Warts of stalk sclerites approach a whorllike arrangement.

Colonies not very large; the largest known has a disc diameter of 18 cm.

Reported from the Philippines, Red Sea, Maldives, Ceylon, northwestern Australia, Port Denison, Tonga Islands, and Viti Islands. Philippine material is from Palawan.

SARCOPHYTON MOSERI Roxas. Plate 1, fig. 6.

Sarcophyton moseri ROXAS, Univ. Philip. Nat. Applied Sci. Bull. 4 No. 1 (1932) 80, figs. 2*a*–2*e*.

The disc, which projects only slightly from the stalk, has primary and secondary folds. There is only one row of siphonozooids between two autozooids. Stalk sclerites are spindles about 0.26 mm long with irregularly placed warts.

Stalk slightly flattened, 3.5 cm high and 4 cm in long diameter. Disc projects only slightly over the slightly broadened apical portion of stalk. Disc has a hollow center and a thin periphery which is divided into seven peripheral folds. Two or three of these are again divided into more or less deep secondaries. Autozooids small and closely set, about 0.5 mm apart, which toward the periphery may still be less. There is usually only one row of siphonozooids between two autozooids, although towards the center there may be two. Sclerites of disc surface are small clubs 0.1 to 1.4 mm long and 0.02 to 0.04 mm wide with well-developed heads. In disc interior are small sticks, at most 0.15 to 0.20 mm long and 0.03 to 0.04 mm wide with irregularly arranged warts. Sclerites of stalk cortex are few small clubs or sticks, 0.07 to 0.1 mm long and 0.02 to 0.03 mm wide, with few warts. A few sclerites are larger and approach those of the stalk interior in form. The latter are larger spindles, 0.20 mm to 0.29 mm long and 0.05 to 0.06 mm wide, with small, irregularly placed warts. Four-rayed sclerites are also found among these spindles.

Locality: Puerto Galera Bay, Mindoro, Philippines.

Type in the University of the Philippines zoölogical collection, Manila.

Sarcophyton moseri is more or less intermediate between *S. ehrenbergi* and *S. acutangulum* in external appearance. In the former the disc periphery has shallow peripheral folds which are not divided into secondaries. In the latter, the peripheral folds are so thorough and deep, with very many secondary folds, that they appear like oak leaves. In skeletal structures, *S. moseri* is intermediate between *S. acutangulum* and *Lobophytum sarcophytoides*. Although a *Sarcophyton*, its sclerites approach those of the latter much closer. Unlike these, however, the

spindles are more pointed and the warts are less prominent and not very regularly arranged to form girdles which are typical of the genus *Lobophytum*. The disc sclerites are also smaller, at most 0.2 mm long, as compared with *L. sarcophytoides*, in which they are from 0.25 to 0.38 mm long. The stalk sclerites of this species can easily be distinguished from those of *S. acutangulum* as they are much broader.

Colonies are not very large; the one described here has a disc diameter of 7 cm.

SARCOPHYTON TROCHELIOPHORUM (Marenzeller). Plate 1, fig. 7.

Sarcophyton trocheliophorum J. MOSER, Mitteil. Zool. Mus. Berlin 9 (1919) 246, figs. 8, 9. (See this for complete synonymy.)
Sarcophytum t. var. *australiensis* THORPE, Journ. Linn. Soc. 36 (1928) 500.

The disc projects far out of the stalk and is much folded at periphery, the folds, at places, becoming fingerlike processes. Between two autozooids eight to ten siphonozooids are found. The stalk sclerites are double spindles, barrel-shaped or blackberry-shaped, on the average 0.2 to 0.3 mm long with two to four whorls of warts.

Disc extends far out of stalk and is folded strongly at periphery. Folds may also become fingerlike processes as a result of growth of periphery of disc. Autozooids 1 to 3 mm apart with about nine siphonozooids between two of them at middle of disc. Cortical sclerites of disc and stalk are small clubs as long as 0.2 mm and somewhat longer, thin sticks. In addition strong, wide spindles, double spindles, and barrel-shaped sclerites are found in stalk cortex. Sclerites of disc interior are sticks 0.5 mm long on the average, usually with fine warts, if present at all. Stalk interior full of wide, stout double spindles and clubs on the average 0.25 mm long (may reach 0.5 mm) covered with pointed thorny warts arranged in two to four whorls. In addition one may find more or less frequently citron- or walnut-shaped sclerites reaching 0.5 mm long.

Colonies are very large; the largest described has a disc diameter of 120 cm.

Reported from Red Sea, Madagascar, Maldives, Ceylon, Philippines, Zanzibar, Western Australia, Sumatra, and tropical west Pacific Ocean. Philippine material obtained from Palawan and Mindoro.

SARCOPHYTON DIGITATUM J. Moser. Plate 1, fig. 8.

Sarcophyton digitatum J. MOSER, Mitteil. Zool. Mus. Berlin 9 (1919) 249, fig. 10; pl. 5, fig. 8.

The disc, which projects far out of the stalk, is not folded at the middle, but drawn at the periphery into long narrow lobes as a result of strong outward folding of the edge. There are seven to eight siphonozooids between two autozooids. The stalk sclerites are thin sticks and slender spindles up to 0.75 mm long.

Smooth cylindrical stalk carries a thin, soft, elastic disc drawn at periphery into fingerlike folds, which bear polyps on outer surface only. Autozooids 5 mm long, 1 to 2 mm apart at edge of disc and 3 to 5 mm at center. Siphonozooids with polyhedral mouth openings, three to eight between two autozooids. Sclerites of stalk and disc cortex very few. These are short sticks with few, small, but pointed warts. In disc cortex they are 0.05 to 0.19 mm long and 0.01 to 0.03 mm wide. At disc periphery cortical sclerites are longer but thinner than at center. Disc interior has sticks 0.08 to 0.35 mm long and 0.01 to 0.05 mm thick, often bent. Stalk cortex with similar sclerites reaching 0.02 mm long and 0.04 mm thick, in addition to spindles 0.3 mm long and 0.15 mm thick with variable warting. In stalk cœnenchyma are sticks 0.2 to 0.75 mm long and 0.03 to 0.08 mm thick, more or less covered with small warts, which oftentimes may be completely absent. Usually they are bent to one side or S-shaped. In addition, clubs 0.15 to 0.4 mm long and 0.05 mm to 0.1 mm thick and spindles at most 0.2 mm long and usually 0.09 mm thick, are found.

Colonies small, largest known has a disc diameter of 7.5 cm, processes included.

Reported only from Puerto Galera Bay, Mindoro, Philippines.

SARCOPHYTON ELEGANS J. Moser. Plate 1, fig. 9.

Sarcophyton elegans J. MOSER, Mitteil. Zool. Mus. Berlin 9 (1919) 252, fig. 11; pl. 5, fig. 9.

The stalk is flask-shaped and the disc, as a result of the ingrowth of certain parts of the rim, has peripheral open folds that are broad basally and narrow apically. There are about twelve siphonozooids between two autozooids. The stalk sclerites are spindles up to 0.5 mm long.

Stalk flash-shaped and disc with peripheral folds wide at base and narrow at apex. Autozooids 2 to 5 mm apart. Siphonozooids very small, five to twelve between two autozooids, their edges not touching each other, but fully covering the entire elevated portions of the disc where autozooids are located. Sclerites of disc cortex are sticks 0.06 to 0.4 mm long and 0.008 to 0.04 mm wide, slightly bent and covered with pointed warts. Sclerites of indefinite forms reaching 0.38 mm long and 0.09 mm wide and covered with high thorny warts are also present, in addition to clubs about 0.07 mm long. Sclerites of disc edge are longer and stronger and have larger warts. In stalk cortex there are similar but more massively built sclerites. Sclerites of disc interior are similar to those of cortex. In stalk cœnenchyma are deformed spindles up to 0.55 mm in length with high and stumpy warts.

Colonies small, the largest known has a disc diameter of 5 cm.

Reported only from the Philippines, Puerto Galera Bay, Mindoro, in water 13 to 25 meters deep.

SARCOPHYTON GLAUCUM (Quoy and Gaimard). Plate 1, fig. 10.

Alcyonium glaucum QUOY and GAIMARD, Voy. Astrolabe 4 (1833) Zooph. 270, pl. 22, figs. 11, 12.

Sarcophyton glaucum J. MOSER, Mitteil. Zool. Mus. Berlin 9 (1919) 253, fig. 12. (See this for complete synonymy.)

The disc that projects far out of the stalk has numerous long folds. There are four to nine siphonozooids between two autozooids. The stalk sclerites are large spindles 0.5 to 2 mm long.

Stalk carries a disc divided into primary and secondary folds that extend up to middle. Autozooids 2 to 5 mm apart, with four to nine small but clearly visible siphonozooids between them. Sclerites of disc and stalk cortex are small clubs and sparsely warted sticks which reach a length of 0.3 mm. In disc interior there are also sticks up to 0.4 mm long. In stalk there are spindles on the average 0.8 mm long that are heavily warted. In many specimens these spindles may reach 2 mm in length, and may be deformed in various ways.

Colonies are large, the largest known has a disc diameter of 1 meter.

Reported from Tonga Islands, Australia, Amboina, East Africa, Maldives, Red Sea, and Philippines. Philippine material ob-

tained from Palawan, Butu Island, Mataguit Island, Shark's Bay, Taytay Bay, and Puerto Galera Bay, Mindoro.

Family NEPHTHYIDÆ Verrill

Nephthyidæ VERRILL, Proc. Essex Inst. 6 (1869).
Spoggodidæ, Nephthyadea, Lemnaliadae GRAY, Ann. & Mag. Nat. Hist. IV 3 (1869) 128–130.
Alcyoniinæ capituliferae KLUNZINGER, Die Korallthiere des Rothen Meeres Theil 1 (1877) 30.
Nephthyidæ + *Siphonogorgiaceae* WRIGHT and STUDER, Rep. Challenger Report 31 (1889) 188f.
Nephthyidæ HOLM, Zool. Jahrb. 8 Syst. (1895) 11f.
Nephthyidæ KÜKENTHAL, Abh. Senkenb. Ges. Frankfurt 23 (1896) 86–88, 134.

Of all the families of Alcyonacea, the Nephthyidæ is probably the hardest to classify. This is mainly due to the enormous number of species under it and the very little differences existing between the various genera. I shall not review the history of the family as this has been done many times by other workers. Suffice it to say that Kükenthal in his revision of the family in 1903 included under it eight genera; namely, *Litophyton, Eunephthya, Capnella, Lemnalia, Scleronephthya, Nephthya, Spongodes,* and *Neospongodes.* Before this revision was fully completed in 1907, Kükenthal had revived the genus *Gersamia* of Marenzeller, and divided the old genus *Spongodes* into *Dendronephthya* and *Stereonephthya.* In 1913, Kükenthal created the genus *Paralemnalia* on the validity of which I have later more to say. Finally, in 1914, Light established the new genus *Lemnalioides,* bringing the number of genera within the family to twelve. Of the above-named genera of Nephthyidæ, three are not found in Philippine waters. Representatives of *Eunephthya* are almost all Arctic forms, confined for the most part to the northern European coast; only two species have been reported from Japan and one species from the Antarctic. The various species of the genus *Gersamia* are confined to the north Atlantic, while those of *Neospongodes* are to be met only along the east coast of tropical South America.

Key to the genera of the family Nephthyidæ.

a^1. Polyp without supporting bundle.
  b^1. Canal wall thin, not heavily filled with sclerites.
    c^1. Polyps arranged in lobes or "catkins"..... *Litophyton* Forskål.

c^1. Polyps single or only in groups.
d^1. Polyps retractile only into a specialized cup.
Gersamia Marenzeller.
d^2. Polyps without specialized cup, completely or partly retractile.
Eunephthya Verrill.
b^2. Canal-wall thick, heavily filled with sclerites.
c^1. Polyps arranged in "catkins" or lobes..... *Capnella* Gray.
c^2. Polyps single or only in groups.
d^1. Stem without internal axis.
e^1. Polyps on unbranched fingerlike processes.
Paralemnalia Kükenthal.
e^2. Stem much branched, polyps on secondary or terminal branches.
f^1. Tentacles with few sclerites, sclerites absent from stomodeal wall of polyps ..... *Lemnalioides* Light.
f^2. Tentacles with numerous sclerites, stomodeal walls of polyps with sclerites..... *Lemnalia* Gray.
d^2. Stem with irregular internal axis formed by irregularly arranged sclerites ..... *Scleronephthya* Wright and Studer.
a^2. Polyp with supporting bundle.
b^1. Polyps arranged in lobes or "catkins"..... *Nephthea* Savigny.
b^2. Polyps separate or in small groups.
c^1. Stem without internal axis.
d^1. Polyps arise in bundles or groups.... *Dendronephthya* Kükenthal.
d^2. Polyps arise usually singly..... *Stereonephthya* Kükenthal.
c^2. Stem with an irregular thin axis formed by thick sclerites.
Neospongodes Kükenthal.

Genus LITOPHYTON Forkskål

Litophyton FORSKÅL, Descriptiones animalium, Hauniae (1775) 139. (Type *L. arboreum.*)

Ammothea (Savigny in MS) LAMARCK, Hist. Nat. Anim. sans Vert. 2 (1816) 410 and 411.

Ammothea SAVIGNY, Descr. de l'Egypte, Hist. Nat. Suppl. I, Atlas, Polypes (1817) pl. 2, fig. 6.

Nephthea AUDOUIN, Explic. pl. Savigny (1828) 49 (error).

Neptaea BLAINVILLE, Man. Actin. (1834) 523 (error).

Ammothea EHRENBERG, Abh. Akad. Berlin Jg. 1832 (1834) 283, 284.

Ammothea MILNE-EDWARDS, Hist. nat. Corall. 1 (1857) 123, 124.

Ammothea KLUNZINGER, Korallthiere des Rothen Meeres 1 (1877) 30, 31.

Nephthya DANIELSSEN, Norske, Nordhavs. Exp., Alcyonida 1 (1887) 81, 82.

Ammothea HOLM, Zool. Jahrb. Syst. 8 (1895) 11–16.

Ammothea KÜKENTHAL, Abh. Senckenb. Ges. Frankfurt 23 (1896) 126, 127.

Ammothea MAY, Jena. Zeitschr. f. Naturw. 33 (1899) 129–132.

Lithophytum KÜKENTHAL, Zool. Jahrb. Syst. 19 (1903) 105.

Lithophytum THOMSON and MCQUEEN, Journ. Linn. Soc. 31 (1908).
Lithophytum KÜKENTHAL, Expeditionen S.M. "Pola" 29 (1913) 19.
Lithophytum LIGHT, Philip. Journ. Sci. § D 10 (1915) 1.

The genus *Litophyton* was established by Forskål in 1775 when he described an animal that he called *Litophyton arboreum.* Lamarck was perhaps not acquainted with this work as he gave the name *Ammothea virescens* to a similar animal, which was pictured by Savigny (1817). Audouin, who in 1828 worked out and named the figures of Savigny, started a great confusion in nomenclature when he made the mistake of calling Savigny's *Ammothea* (pl. 2, fig. 6) *Nephthea cordieri,* and calling another animal (pl. 2, fig. 5), a true *Nephthea, Nephthea chabrolii.* This was followed by a greater mistake of Blainville who called pl. 2, fig. 6, *Neptaea innominata* and pl. 2, fig. 5, *Neptaea savignyi.* Ehrenberg, however, brought order to the matter when he established correctly that tab. 2, fig. 6, is *Ammothea.* Later Klunzinger (1877) showed that *Ammothea viriscens* was identical with Forskål's *Litophyton arboreum.* A number of workers, including Holm, Kükenthal, and May, used the name *Ammothea* for some time, but as there is no question that *Litophyton* is the older name, it must be used in preference to *Ammothea.* To some workers, Danielssen (1887), for example, there was no difference between *Ammothea* and *Nephthea.* It was Kükenthal who drew a sharp boundary between these two genera although Kükenthal changed the name *Litophyton* to *Lithophytum.* I am using *Litophyton* as it was the one first used by Forskål.

The following is the diagnosis of the genus *Litophyton:* Colony bushlike or treelike with soft and flexible stem and branches. Polyps nonretractile and without any "Stützbundel," grouped together in the form of lobes or "catkins." Canal walls thin and with only very few scattered sclerites.

Key to the species of Litophyton Forskål.

a^1. Polyps present only in lobes at end of branches.
  b^1. Polyps in flat umbels at ends of branches.
    c^1. Polyp sclerites more than 0.2 mm..... *L. graffei* (Kükenthal).
    c^2. Polyp sclerites less than 0.2 mm..... *L. erinaceum* Kükenthal.
  b^2. Polyps in rounded lobes at upper ends of branches.
    L. carnosum (Kükenthal).
a^2. Polyps in lobes at different levels of branches.
  b^1. Sclerites absent from polyp.

c^1. Cortical sclerites only spindles.
d^1. Cortical sclerites finely adorned spindles less than 0.2 mm long. *L. ramosum* (Quoy and Gaimard).
d^2. Cortical sclerites regular spindles more than 0.2 mm long with prominent, rough thorns.
e^1. Stem and branches long and slender..... *L. lighti* nom. nov.
e^2. Stem and branches short, thick and stout..... *L. rigidum* Light.
c^2. Cortical sclerites spindles and small irregular bodies.
d^1. Branches and lobes short and stout..... *L. viridis* (May).
d^2. Branches and lobes long and slender..... *L. stuhlmanni* (May).
b^2. Sclerites present in polyps.
c^1. Cortical sclerites without spindles, sclerites are rounded bodies with long thorns ..... *L. sanderi* (May).
c^2. Cortical sclerites with spindles.
d^1. Cortical sclerites are spindles and irregular small bodies. *L. arboreum* Forskål.
d^2. Cortical sclerites only spindles.
e^1. Spindles much scalloped and with very large thorns. *L. formosanum* Kükenthal.
e^2. Spindles not scalloped.
f^1. Spindles with few conical warts..... *L. confertum* Kükenthal.
f^2. Spindles with many high thorns.
g^1. Sclerites found in tentacles of polyps only. *L. acutilofolium* Kükenthal.
g^2. Sclerites present in body as well as tentacles of polyps.
h^1. Cortical sclerites more than 0.3 mm long. *L. crosslandi* Kükenthal.
h^2. Cortical sclerites less than 0.3 mm. *L. orientale* sp. nov.

LITOPHYTON LIGHTI nom. nov.

Lithophytum philippinensis LIGHT, Philip. Journ. Sci. 10 (1915) 3, pl. 1.

Colony tall, branches long and flaccid, lobes long and polyps not closely set. Polyp body and tentacles without sclerites.

Colony tall, much branched, bushy or treelike and soft. Main stem gives off a number of long branches at different levels. Lobes are carried on primary and secondary branches which are all slender. Lobes long, elongate, cylindrical, on the average about 20 mm long. Polyps lie singly or in small groups but not crowded. They are 0.6 to 1 mm long and 0.5 to 0.7 mm wide with short thick tentacles. Sclerites absent in polyp body and tentacles. Sclerites of stem cortex are straight or slightly bent spindles 0.2 to 0.45 mm long and 0.025 to 0.04 mm wide with blunt warts and divided tips. Among these are smaller, shorter, and smoother rodlike sclerites with few conical proj-

ections. Cœnenchymal walls with few large spindles, 0.8 mm long and 0.08 mm wide, covered with small projections.

In life the stem is light yellow or brown, while the polypary is brownish green to green. Light's type (C–246) and cotype were obtained in Little Balatero Cove, Puerto Galera Bay, Puerto Galera, Mindoro, and Taytay Bay, Palawan, respectively. This is the commonest species of *Litophyton* in Philippine waters.

Ammothea is a synonym of *Litophyton*. May described a form which he called *A. digitata* var. *philippinensis* that at the time of Light's writing (1915) was *L. digitata* var. *philippinensis*. In the present paper, I am showing that this form is *Lemnalia philippinensis*. Even so, the specific name *L. digitata philippinensis* was preoccupied at the time of Light's writing. I have, therefore, changed the name of this species to *L. lighti*.

LITOPHYTON RIGIDUM Light.

Lithophytum rigidum LIGHT, Philip. Journ. Sci. § D 10 (1915) 5, pl. 2.

Colony low, stout, with short, thick stem and branches, lobes short and polyps rather crowded. Polyp body and tentacles devoid of sclerites.

Colony short, stout with rigid stumpy appearance. The base gives rise to a number of cylindrical, swollen, fleshy stems. These in turn give off, mostly at their ends, two or more short main branches. The lobes are carried on short, almost invisible, lateral and terminal branches arising from these main stems. Lobes thick or conical, about 9 mm long and 3.5 mm wide at base. Polyps 0.5 to 0.8 mm high and 0.4 to 0.7 mm wide, tubular or club-shaped, arranged singly or in groups. Polyp bodies and tentacles without sclerites. Polyp groups have a crowded appearance. Sclerites of cortex are straight or curved spindles 0.15 mm to 0.4 mm long and 0.02 to 0.04 mm wide, with large irregular projections, mostly conical or slightly flattened. Ends of sclerites irregular and usually divided. Among spindles are few rod-shaped sclerites, 0.07 mm long and 0.01 mm wide, with few low warts. Canal walls with few, large, straight, or slightly curved spindles, 0.8 mm long and 0.1 mm wide, with numerous low warts.

In life, colony is greenish to light yellow.

Light's type (C–2097) was obtained from reefs in Taytay Bay, Palawan.

LITOPHYTON ORIENTALE sp. nov. Plate 3, figs. 5a-5d.

Colony tall, much branched, and flabby. Lobes long, and polyps not crowded. Sclerites absent in terminal branches and body of lobes, but present in polyp body and tentacles.

A portion of a large colony, much branched like a tree. Terminal branches tend to come out in groups, or four of them arising from almost the same level as the larger branches. Lobes 10 to 15 mm long and 2 to 3 mm wide, arising only from terminal branches, which are 30 to 45 mm long. Polyps on lobes not crowded nonretractile, 0.7 to 0.9 mm long, and 0.4 to 0.5 mm wide with slender tentacles 0.32 mm long and 0.08 mm wide, provided with six rounded pinnules on either side. Sclerites absent from terminal branches and bodies of lobes but present on polyp bodies and tentacles. Those on polyp body are sticks 0.12 mm to 0.15 mm long and 0.019 to 0.03 mm wide with relatively large warts. Sclerites of tentacles are numerous, tiny, flat, irregular sticks, 0.037 mm long and 0.0074 mm wide, laid down with no special arrangement. Main branches have thin cortex, and the longitudinal lines separating the outer canal walls from the cortex are clearly visible. Cortical sclerites are straight or slightly curved spicules, 0.22 mm to 0.32 mm long and 0.025 to 0.045 mm wide, with rather prominent simple warts or knobs. Ends rugged, but no central axis which supplies the end knobs is visible. A few cortical sclerites are shorter and thinner. Gastric canal walls thin and contain only very few spindles 0.27 to 0.76 mm long and 0.064 to 0.11 mm wide with low rounded or irregular warts all around.

Polyps are buffy brown, while the stem and branches are light vinaceous fawn.

Type: No. C–5011, University of the Philippines zoölogical collection. From Large Balatero Cove, Puerto Galera, Mindoro.

This form approaches *L. lighti* nom. nov. in the mode of branching, cortical and canal-wall spiculation. It differs, however, from it and from *L. rigidum* in having prominent sclerites in the polyp body and tentacles. *Litophyton orientale* differs from *L. confertum* in colony growth and in having cortical and polyp sclerites with more-prominent warts. From *L. formosanum* it differs in the form of the colony and in the arrangement of polyp sclerites. In *L. formosanum* the sclerites are in eight double rows, an arrangement totally absent in the present species. It differs from *L. acutifolium* in having

much smaller sclerites in tentacles and cortex of stem and in having sclerites on the body and base of the polyps. From *L. crosslandi,* it differs in having larger lobes, but smaller sclerites on the polyp body.

Genus CAPNELLA Gray

Capnella GRAY, Ann. & Mag. Nat. Hist. IV 3 (1869) 129.
Paranephthya WRIGHT and STUDER, Challenger Report, Zoöl. 31 (1889) 227.
Paraspongodes (ex parte) KÜKENTHAL, Abh. Senckenb. Ges. Frankfurt 23 (1896) 132.
Paraspongodes (ex parte) MAY, Jena. Zeitschr. f. Naturw. 33 (1899) 145.
Paranephthya STUDER, Alcyon. de l'Hirondelle (1901) 30.
Capnella KÜKENTHAL, Zoöl. Jahrb. Syst. 19 (1903) 127.
Capnella LIGHT, Philip. Journ. Sci. § D 8 (1913) 435.

We owe the establishment of the genus *Capnella* to Gray (1869) when he renamed *Alcyonium imbricatum* Quoy and Gaimard *Capnella imbricata* and gave the first diagnosis of the genus. Gray's work evidently did not come to the notice of Wright and Studer, who in 1889 published the name *Paranephthya* and a diagnosis similar to that given by Gray. When Kükenthal created his genus *Paraspongodes* (1896), he included *Paranephthya* under it, which example was followed by May. In 1901 Studer again revived the genus *Paranephthya,* but as the older name should be followed, Kükenthal in his revision of the Nephthyidæ (1903) settled the matter by using the name *Capnella.* Kükenthal, however, gave a diagnosis which can no longer be held in the light of the work of Light (1913). Kükenthal characterized *Capnella* as always having "Blattkeulen," but as will be seen in this paper a number of the members of the group do not possess such foliaceous club in the polyps. Light's diagnosis is excellent and is reproduced as follows:

> The colony is upright, tree-like or bushy; the nonretractile polyps, without "Stützbundel," are grouped on lobes or scattered singly on branches and twigs, and are thickly covered with a coat, usually one spicule deep, of minute foliaceous clubs or clubs and spindles which is continued with some changes in the form of the spicules on to the stem cortex. The canal walls contain numerous spindles, clubs or cross-shaped spicules. The canals are numerous and small with fairly thick walls. Their cavities are sometimes very small or lacking in the center of the stem, resulting in the formation of an irregular central axis.

Thirteen species and varieties have been described as belonging to the genus. A revision of the group, however, shows that there are only seven valid species, as follows:

1. CAPNELLA IMBRICATA (Quoy and Gaimard).
   Capnella capitulifera (Wright and Studer).
   Capnella philippinensis Light.
   Capnella philippinensis var. *mindorensis* Light.
   Capnella philippinensis var. *arborea* Light.
   Capnella philippinensis var. *albida* Light.
2. CAPNELLA SPICATA (May).
3. CAPNELLA RAMOSA Light.
4. CAPNELLA PARVA Light.
5. CAPNELLA FUNGIFORMIS Kükenthal.
6. CAPNELLA RUGOSA (Kükenthal).
   Capnella gilchristi Thomson.
7. CAPNELLA MORULA Thomson and Mackinnon.

The reasons for so placing *C. capitulifera* and *C. philippinensis* are set forth under the description of *C. imbricata.* Thomson created his new species *C. gilchristi* as distinct from *C. rugosa* in the belief that its sclerite arrangement is wholly different, Kükenthal not having described such an arrangement of sclerites in his diagnosis of *C. rugosa.* However, I had occasion to examine Kükenthal's material of *C. rugosa* very carefully and found that a similar sclerite arrangement occurs. This, together with the identical types and measurements of the sclerites in the two, makes me place *C. gilchristi* as identical with *C. rugosa.* In addition to the seven species, I am naming *Capnella sabangensis,* making the number of valid species eight.

Key to the species of the genus Capnella Gray.

a^1. Polyp sclerites capstans and foliaceous clubs.
C. imbricata (Quoy and Gaimard).
a^2. Polyp sclerites clubs and spindles.
b^1. Polyp sclerites 0.16 mm long or less..... *C. spicata* (May).
b^2. Polyp sclerites more than 0.16 mm but less than 0.36 mm long.
c^1. Colony large, bushy, with long pointed lobes..... *C. ramosa* Light.
c^2. Colony small, compact with rounded lobes.
d^1. Cortical sclerites of stem double spindles..... *C. parva* Light.
d^2. Cortical sclerites of stem cylinders.... *C. fungiformis* Kükenthal.
b^3. Polyp sclerites more than 0.36 mm long..... *C. rugosa* (Kükenthal).
a^2. Polyp sclerites spindles and irregular sticks.
b^1. Cortical sclerites of stem spindles with long, slender, pointed, closely-set thorns or projections..... *C. sabangensis* sp. nov.
b^2. Cortical sclerites of stem spindles with low, blunt warts.
C. morula Thomson and Mackinnon.

CAPNELLA IMBRICATA (Quoy and Gaimard). Plate 3, figs. 1a to e.

Alcyonium imbricatum QUOY and GAIMARD, Voy. Astrolabe, Zool. 4 (1833) 281, pl. 3, figs. 12–14.

Ammothea imbricata MILNE-EDWARDS, Hist. Nat. Corall. 1 (1857) 124.

Capnella imbricata GRAY, Ann. & Mag. Nat. Hist. IV 3 (1869) 129.

Ammothea imbricata STUDER, Monatsb. Akad. Wiss. Berlin (1878) 634.

Paranephthya capitulifera WRIGHT and STUDER, Challenger Report, Zool. 31 (1889) 227, pl. 36 A, figs. 1*a*, 1*b*; pl. 42, fig. 8.

Paranephthya capitulifera STUDER, Alcyon. aus Sammlung des naturhist. Mus. Lubeck (1894) 127.

Paraspongodes capitulifera MAY, Jena. Zeitschr. f. Naturw. 33 (1899) 154, 155.

Capnella capitulifera KÜKENTHAL, Zool. Jahrb. 19 (1903) 128.

Capnella philippinensis LIGHT, Philip. Journ. Sci. § D 8 (1913) 436.

Colony compact looking, treelike, with very short branches. Sclerites of polyps capstanlike and foliaceous clubs. Those of stem cortex also capstanlike; canal walls with four-rayed sclerites.

Colony treelike, usually branching, with polyps arranged in lobes around the terminal branches. In contracted specimens the polyps may be so compactly arranged as to appear to be overlapping each other. Polyps are from 1.8 to 2.2 mm high and 0.8 to 1.5 mm wide. Tentacles are short, blunt, with about twelve pairs of closely packed pinnules. Armature of polyps consists of capstanlike sclerites, 0.075 to 0.1 mm high and 0.06 to 0.075 mm wide, and foliaceous clubs, 0.12 to 0.17 mm long and 0.04 to 0.07 mm wide. Sclerites of stem cortex are similar to the capstanlike sclerites of the lower portion of the polyps, forming a densely packed layer. Inner cortical sclerites are few, in the form of small, smooth, four-rayed sclerites, 0.16 mm long and 0.14 mm wide. Stalk canal walls full of 4-rayed sclerites, 0.18 to 0.22 mm long and 0.16 to 0.2 mm wide, irregular, thick or barrel-shaped sclerites, 0.17 to 0.28 mm long and 0.16 to 0.24 mm wide with very numerous, rounded, compactly arranged warts. Basic form of canal-wall sclerites is the four-rayed type, which, by growth and wart formation, may transform into irregular, rounded, or barrel-shaped sclerites with prominent and heavy warting. Color in life from very light brown to light green.

Reported from New Ireland and the Philippines.

Kükenthal's description of the species was based on three small specimens, two from the Hamburg Museum obtained from

Duke of York, New Ireland, and one in the Berlin Museum from the Gazelle-Carteret-Hafen collection of unknown origin. Kükenthal's description of *C. capitulifera* was based on one specimen obtained from Sulu Sea, Philippines. Light described *C. philippinensis* from fifty specimens from various parts of the Philippines. My own collection consists of four specimens from Puerto Galera, Mindoro. Both lots were taken to Berlin for comparison. Examination of the material labelled *C. imbricata, C. capitulifera,* and *C. philippinensis* revealed that they are identical in skeletal composition. Light established his new species as a result of Kükenthal's statement that "Blattkeulen" are present in the canal walls of *C. capitulifera.* These, however, are not present in the specimens of *C. capitulifera* of Kükenthal that I have examined. *Capnella philippinensis* was distinguished from *C. imbricata* in the structural difference of the sclerites of the stem cortex and polyps. Such a difference, however, does not exist, as both capstanlike and foliaceous sclerites are present in the polyps of both and capstanlike armature is also present in the cortex of *C. imbricata.* I have examined the armature of about forty Philippine specimens that I had labelled *C. philippinensis,* and I found no way in which they differ from those of *C. imbricata.* The dimensions of the cortical and canal sclerites have such a wide variability that no real value can be attached to a difference in the proportion in size between the two.

Light, from a study of fifty lots of Philippine *Capnella,* named three varieties in addition to the typical *C. philippinensis;* namely, var. *mindorensis,* var. *arborea,* and var. *albida.* Some of my material falls under each of these, but there are also specimens that cannot be placed under any one of them due to the extreme variability in the external form of the species. It is thought wise, therefore, to include all these varieties under *Capnella imbricata.*

CAPNELLA RAMOSA Light. Plate 3, fig. 3a.

Capnella ramosa LIGHT, Philip. Journ. Sci. § D 8 (1913) 448, pl. 2, figs. 1–3; pl. 3, figs. 2*a*–2*g*.

Colony large, bushy, with very long slender branches. Polyp sclerites small, straight or curved spindles and thorny or foliaceous clubs. Cortical sclerites clubs and small thick spindles. Canal walls with thick spindles, double spindles, or barrels.

Colony treelike and bushy with numerous slender branches. Polyps scattered in twos or threes all over primary, secondary, and terminal branches. Polyps about 2 mm high and 1.2 mm wide at the tentacular region. Tentacles thick and plump with closely packed pinnules. Sclerites of polyps are straight or curved spindles, 0.21 to 0.26 mm long and 0.016 to 0.03 mm wide, with numerous, fine but prominent warts and clubs, 0.18 to 0.24 mm long and 0.05 to 0.06 mm wide, with warty or foliaceous head. Sclerites of stem cortex are stout spindles, 0.16 to 0.2 mm long and 0.05 to 0.114 mm wide, with warty or toothed head. Canal walls contain numerous stout spindles, 0.14 to 0.2 mm long and 0.08 to 0.1 mm wide, and double spindles or cylinders, 0.16 to 0.2 mm long and 0.06 to 0.08 mm wide with heavy warts.

Stem and main branches with narrow canals and with thick walls so that large stems may have irregular axislike center.

From Sabang Cove, Mindoro, Philippines.

Colony large; the one described by Light has a total height of 130 mm and a breadth of 100 mm. Color olive-green with a grayish tinge.

CAPNELLA PARVA Light. Plate 3, figs. 4a, 4b.

Capnella parva LIGHT, Philip. Journ. Sci. § D 8 (1913) 446, pl. 1, fig. 8; pl. 2, figs. 3*a*-3*e*.

Colony small, rigid, treelike, with short branches. Polyps sclerites simple spindles and clubs. Cortical sclerites thick, short, double spindles. Sclerites of canal walls barrels and double-spindle clubs.

Colony small, rigid, slender, and treelike. Distal part of stem divides into a number of branches on which the lobes of polyps are arranged. Lobes cylindrical with rounded ends, about 4 mm high and 2.5 mm wide. Sclerites of polyps are clubs with few but prominent warts, 0.14 to 0.3 mm long and 0.03 to 0.08 mm wide with few but prominent warts, especially at the head, and spindles, straight or curved, 0.21 mm to 0.29 mm long and 0.03 mm to 0.08 mm wide also with few small or large warts. In the stem cortex are short, rounded, double spindles, 0.11 mm to 0.115 mm long and 0.05 to 0.08 mm wide, with high, narrow warts, and irregular clublike bodies, 0.08 mm to 0.125 mm long and 0.04 to 0.076 mm wide. Cœnenchymal sclerites in canal walls barrels, double spindles, or irregular forms, 0.15 mm to 0.2 mm

long and 0.09 mm to 0.1 mm wide. In addition, some irregular knobbed clublike forms, 0.095 mm to 0.133 mm long and 0.079 to 0.107 mm wide, are also present.

From Bantayan Islands, off Cebu.

Colonies small, the largest known has a height of 32 mm.

CAPNELLA SABANGENSIS sp. nov. Plate 3, figs. 2a, 2b.

Colony low with very short base, lobes and polyps small, polyp sclerites simple spindles and irregular sticks, cortical sclerites spindles with long pointed warts, canal walls with large spindles with numerous low warts.

Colony shrublike with low wide base, usually wider than high. This gives rise to short, almost invisible branches on which the lobes of polyps are thickly set. Lobes small, the largest about 3 mm high and 2 mm wide. They are compactly arranged, those situated internally partially hidden by those situated externally. Polyps very small, about 0.3 mm to 0.4 mm high with their apical ends slightly bent towards center of lobes so as to hide the mouth openings. Polyps with simple, slender, straight or curved spindles, 0.2 to 0.6 mm long and 0.12 to 0.3 mm wide, with fine warts mostly towards the ends, and irregular sticks, 0.1 to 0.2 mm long and 0.01 to 0.03 mm wide, with numerous prominent projecting thorns. The spindles lie superficially and are arranged longitudinally around the polyps, but not gathered together to form a supporting bundle. The irregular sticks lie most internally and have no definite arrangement. In stem cortex are spindles or clubs, 0.2 to 0.4 mm long and 0.02 to 0.05 mm wide (excluding spines), with numerous, prominent projecting thorns. A few are smaller and with only few warts. In the canal walls are large stout spindles, 0.5 to 1.15 mm long and 0.07 to 0.18 mm wide, with numerous low warts. Few of these may be forked or otherwise branched. Color in life, yellowish green.

Type: No. C–5012, University of the Philippines zoölogical collection, collected from Sabang Cove, Mindoro, Philippines.

This species is described from three examples. The largest is 28 mm high and 35 mm wide; another is 23 mm high and 31 mm wide; the third is 16 mm high and 18 mm wide. This species approximates *C. morula* in having the polyps slightly incurved so as to hide the mouth openings. It differs from it, however, in spiculation. *Capnella sabangensis* has the smallest polyps and lobes of any member of the genus.

Genus PARALEMNALIA Kükenthal

The genus was established by Kükenthal in 1913 when he renamed *Lemnalia thyrsoides* Ehrenberg, *Paralemnalia thyrsoides*. Until 1903 this species had been taken along with the group *Ammothea* which of course is now *Litophyton*. In 1907, however, Reinhart studied the minute anatomy of this species together with other species of Alcyonacea and concluded that it differs from most species of *Litophyton* in having a well-developed canal system deep under the ectoderm. It also differs from the other members of this genus in having the gastric canals of the polyps extending down to the base of the colony and in having a distinct structure of the lateral and ventral gastral filaments. Reinhart himself came to the conclusion that the genus *Litophyton* was bulky and needed splitting. Such a move was followed by Kükenthal (1913) when some of the former species belonging to *Litophyton* were transferred to *Lemnalia* and *Ammothea thyrsoides* to the new genus *Paralemnalia*. Kükenthal had in his possession a number of examples of this form, and it became evident to him that it did not fit into the genus *Lemnalia*. It is to be regretted that Thomson and Dean (1931) were not convinced of the validity of the genus. Their main contention, however, based on the variable retractibility of the polyps, cannot hold. Kükenthal himself observed this phenomenon, which led him to detect the retractibility of the polyps. The fact remains, however, that the habitus of *Paralemnalia* is different from that of *Lemnalia*. The colony is composed of a number of fingerlike, unbranched, main stems arising from a common flat or upright base. The polyps, which in *Lemnalia* are confined on the terminal branches and branchlets, are here all over the undivided main stems. These two characteristics, with the complete retractibility of the polyps as well as that of the different mode of canal formation, to my mind, warrant the recognition of the genus.

PARALEMNALIA THYRSOIDES (Ehrenberg). Plate 2, fig. 1; Plate 4, fig. 9.

Paralemnalia thyrsoides KÜKENTHAL, Zool. Ergeb. 29 (1913) 1–33.

From a very extensive, spreading, thin base, numerous cylindrical fingerlike processes arise. These are single, extending upward without branching, although usually two or three may be fused at their bases where they arise from the base. The lobes may be as large as 55 mm long and 8 mm in diameter, although the majority are around 35 mm long and 6 mm wide. The polyps

are uniformly distributed over the lobes from the base to the tip. They are about 1 mm apart, sessile and retractile; in many cases only the apical portions and the tentacles are visible from the outside.

In the cortex base are small, straight sticks or spindles, 0.6 to 0.11 mm long and 0.15 mm wide, with few but prominent warts, which may be arranged in two or more separate girdles. In the cœnenchyma just under the cortex are numerous, smooth, slender spindles, 0.35 to 0.45 mm long and .02 mm wide, with few, very fine, widely separate warts. In the cortex of lobes and polyps are sticks or clubs similar to those of the base, although slightly larger, 0.13 to 0.15 mm long. A few reach a length of 0.18 mm. In the cœnenchyma of the lobes are sclerites similar to those of the base. In the tentacles are minute sclerites 0.03 to 0.05 mm long with prominent warts also arranged in zones.

Philippine material (C–672) was obtained from Bantayan Islands. Several small colonies were collected from Puerto Galera, Mindoro.

Genus LEMNALIOIDES Light

Lemnalioides LIGHT, Philip. Journ. Sci. § D 9 (1914) 233.

Light (1914) working on a collection of Alcyonacea from the Philippines established this genus from a specimen collected from Puerto Galera Bay, Mindoro. The colony is much branched like that of *Lemnalia*, showing a definite bare, sterile, basal region and polyp-bearing branches. Like *Lemnalia* and unlike *Paralemnalia*, *Lemnalioides* often has the polyps in small groups on the lateral and terminal branches. The polyps, which are tubular and nonretractile, have no stomodeal sclerites and have only very few sclerites in the tentacles. The polyps, also, unlike those of *Lemnalia* and *Paralemnalia*, have numerous mesenterial filaments, which extend to the base of the colony. Light's diagnosis of the genus is as follows:

> The colony is upright, treelike, or bushy, and consists of a number of stems coalesced in one or more groups for some distance above the base. The tubular, nonretractile polyps are scattered singly or in little groups on the branches and lateral and terminal twigs. The spiculation of the cortex and the canal walls is similar to that in *Lemnalia*. The tentacles contain a very few, very small, scattered spicules, and the stomodæum contains no spicules. The tentacles bear more than one row of pinnules, and show a median longitudinal band of muscle fibers on their outer surfaces. The type of the genus is *Lemnalioides kükenthali* sp. nov.

LEMNALIOIDES KÜKENTHALI Light.

Lemnalioides kükenthali LIGHT, Philip. Journ. Sci. § D 9 (1914) 233, pl. 1; text figs. 1–6.

Colony consists of two main stalks, which divide to form a number of stems. These in turn divide and subdivide to form several branches that arise close together. These finally give rise to numerous lateral and terminal twigs. Polyps scattered singly or arranged in small groups. They are more or less tubular and nonretractile, 1 to 2 mm long and 0.05 mm wide. Tentacles are prominent with two rows of short but thick pinnules on either side. Polyp sclerites are sparsely arranged, smooth, irregular, bent or curved spindles, 0.15 to 0.2 mm long and 0.005 to 0.008 mm wide, with finely divided tips. Cortical sclerites of stems and branches are curved spindles, 0.15 to 0.29 mm long and 0.008 to 0.02 mm in diameter, with few widely separate warts. Among the spindles are few, heavier, curve sclerites whose convex sides show few prominent projections. In the cortex towards the base they become shorter and heavier-looking and develop numerous blunt projections on the convex side. In the extreme base the cortical sclerites are double stars and capstanlike, 0.06 to 0.08 mm long and 0.02 to 0.07 mm in diameter.

In the cœnenchyma are smooth sticks with few low warts and finely divided tips. These are 0.25 to 0.5 mm long and 0.009 to 0.026 mm wide.

Light's type (C–2611) has a total height of 115 mm and a polypary expanse of 110 mm with a base 38 mm long and 25 mm wide. "The stem is yellowish brown and the polyp-bearing portion is light brown in formalin."

Locality: Puerto Galera Bay, Mindoro.

Genus LEMNALIA Gray

Lemnalia GRAY, Ann. & Mag. Nat. Hist. 2 (1868) 442.
Lemnalia GRAY, Ann. & Mag. Nat. Hist. IV 3 (1869) 130.
Lemnalia BOURNE, Trans. Linn. Soc. London 7 (1900) 527.
Lemnalia KÜKENTHAL, Zool. Jahrb., Syst. 19 (1903) 133.
Lemnalia KÜKENTHAL, Exp. S. M. "Pola," Alcyon. des Roten Meeres 29 (1913) 14.
Lemnalia LIGHT, Philip. Journ. Sci. § D 9 (1914) 242.

The genus *Lemnalia* was established by Gray in 1868 from a hitherto undescribed alcyonacean which he called *Lemnalia jukesi*. In this work he also correctly included under his new genus *L.*

terminalis, formerly *Alcyonium terminale* (Quoy and Gaimard), and *L. nitida,* formerly *Ammothea nitida* of Verrill. Bourne (1900) emended the diagnosis of the genus and described two new species, *L. rhabdota* and *L. peristyla.* Kükenthal (1903) in his revision of the family Nephthyidæ, added a new species, *L. umbellata,* and another, *L. cervicornis* (formerly *Ammothea cervicornis* of May). In the same revision, he included five species of *Ammothea* under the revived genus of *Litophyton,* which later (1913), however, he transferred correctly to the genus *Lemnalia.* These are *L. africana* (May), *L. flava* (May), *L. elegans* (May), *L. brassica* (May), and *L. armata* (Kükenthal). Light, while working on his genus *Lemnalioides,* identified and named three species of *Lemnalia* from the Philippines, the descriptions of which remain unpublished. These are *L. kükenthali, L. bournei,* and *L. bantayensis.* Light's *L. kükenthali,* however, is identical with May's *Ammothea digitata* var. *philippinensis,* so that I am calling it *Lemnalia philippinensis* (May). In addition to these I am reporting here four species of *Lemnalia* which are apparently new; namely, *L. grandispina, L. faustinoi, L. scasa,* and *L. zimmeri.* A form similar to *L. laevis* Thomson and Dean is also represented in this collection.

The genus *Lemnalia* may be diagnosed as follows: The colony which arises from a common broad basis is composed of several much-branched stems that are oftentimes coalesced with each other for a certain distance of their length. The polyps which arise singly, in small groups or in bundles but never in lobes or catkins, are found either arising from the tertiary or terminal twigs, and are not retractile. Stem cortex smooth-looking but with numerous sclerites, spindles, clubs, double stars, modified double stars with two long projecting thorns on either side, or crescent-shaped. Canal walls very thin, but full of a dense matting of spindlelike sclerites. Polyps usually provided with small spindles with fine warts, while the tentacles have either tiny spindles with fine warts or flat scales with granular surface. Tentacles have only one row of pinnules on either side. Stomodeal wall of polyps with tiny spindles with prominent projecting thorns.

The genus as so diagnosed differs markedly from *Litophyton* in having the polyps not arranged in lobes or catkins but singly or in small groups or bundles. In *Litophyton* the lobes are found on the main stems as well as in different levels of the

branches, while in *Lemnalia* they are found only in the upper portion of the colony quite separate from the sterile trunk. Another marked difference lies in spiculation. The canal walls of *Litophyton* is almost or entirely free from sclerites. If these are present, they are very few and very large. Finally *Litophyton* is very smooth and slimy to feel and the colony is very soft and pliable. The differences between *Lemnalia* and *Paralemnalia* will be set forth in the part dealing with the latter.

Key to the species of the genus Lemnalia Gray.

a^1. Polyps numerous, closely set, arranged in spikes.
  b^1. Sclerites of tentacles tiny, warty spindles.
    c^1. Colony low, massive, terminal twigs broad and stout.
      d^1. Cortical stem sclerites with double stars.... *L. bournei* Light MS.
      d^2. Cortical stem sclerites with spindles only..... *L. brassica* (May).
    c^2. Colony slender, terminal twigs elongate.
      d^1. Terminal twigs small, short..... *L. bantayensis* Light MS.
      d^2. Terminal twigs large, long.
        e^1. Cortical sclerites without double stars.
          f^1. Cortical sclerites without irregular clubs.
            L. umbellata Kükenthal.
          f^2. Cortical sclerites without irregular clubs.
            g^1. Cortical sclerites are bent, warty spindles. *L. flava* (May).
            g^2. Cortical sclerites are straight, smooth spindles.
              L. africana (May).
        e^2. Cortical sclerites with double stars.
          f^1. Cortical sclerites only double stars..... *L. elegans* (May).
          f^2. Cortical sclerites crescents and double stars.
            L. philippinensis (May).
  b^2. Sclerites of tentacles, flat scales with finely granular surface.
    c^1. Colony low, terminal twigs short.
      L. squamifera Thomson and Dean.
    c^2. Colony high, terminal twigs longer.
      d^1. Cortical sclerites spindles only..... *L. jukesi* Bourne.
      d^2. Cortical sclerites warty spindles and irregular double stars.
        e^1. Double stars stout and short.....*L. rhabdota* Bourne.
        e^2. Double spindles narrow, longer..... *L. peristyla* Bourne.
a^2. Polyps not numerous, not crowded, not arranged in spikes.
  b^1. Polyps sessile, not stalked.
    c^1. Terminal branches very short and stout..... *L. armata* Kükenthal.
    c^2. Terminal branches long and slender.
      d^1. Terminal twigs less than 1 mm in diameter, polyps globular.
        L. scasa sp. nov.
      d^2. Terminal twigs more than 1 mm in diameter, polyps flat.
        L. zimmeri sp. nov.
  b^2. Polyps shortly pedicellate.
    c^1. Colony branched only at extreme apical portion.

d^1. Polyps short, cortical stalk sclerites spindles only.
L. faustinoi sp. nov.
d^2. Polyps long, cortical stalks sclerites with modified double-stars.
L. cervicornis (May).
c^2. Branching of colony starts from lower part.
d^1. Colony tall, large, cœnenchymal sclerites branched at ends.
L. laevis Thomson and Dean.
d^2. Colony low, medium sized, cœnenchymal sclerites not branched at ends.
e^1. Cortical sclerites only large double stars.
L. grandispina sp. nov.
e^2. Cortical sclerites with crescents and modified double stars.
f^1. Stem dichotomously branched..... *L. nitida* Bourne.
f^2. Stem not dichotomously branched.
L. terminalis Bourne.

LEMNALIA BOURNEI Light MS. Plate 4, fig. 1.

Colony low, stem short. Polyps closely set on very short terminal branches. Sclerites of stem cortex irregular double stars and crescents. Sclerites of canal walls, polyps, and tentacles are spindles with few or many warts.

The stem is very short and stumpy, coalesced together for about one-half to one-third of entire length to form a common base. The stems at their extreme ends give off several very short, almost unnoticeable, stout secondary branches from which the terminal twigs arise. Terminal branches also very short, never more than 15 mm long and 2 mm wide. Stem smooth-looking but granular to the touch. Polyps sessile, arranged very close together and regularly all around the terminal twigs, appearing in badly contracted specimens as if they were in lobes. They are nonretractile, but very contractile, protruding only very slightly over the surface of the terminal branches. Polyps and tentacles with numerous sclerites in the form of tiny spindles. Sclerites of polyp body are arranged horizontally while those of the tentacles are diagonally or longitudinally placed. Cortical sclerites of stem are bent or crescent-shaped spindles, 0.15 to 0.2 mm long and 0.02 mm wide, with prominent warts, and irregular double stars, 0.08 mm long and 0.03 mm wide, with one ray of each star produced into a spinous process. There are forms intermediate between the double stars and the crescents. In the canal walls is a dense matting of simple straight spindles, 0.2 to 0.46 mm long and 0.015 to 0.02 mm wide, with few or many fine warts. Those in the polyps are similar sclerites, 0.22 to 0.27 mm long and 0.01 mm wide. Those in the tentacles are still smaller, 0.18 mm long and 0.01 mm wide, also with fine warts.

Colony usually small; Light's type, No. C–238, University of the Philippines zöological collection is about 60 mm in total height. Color in life olive-gray or Quaker drab.

This species is closest to *L. brassica* (May) in external form, in that both of them are low with short stout stems. The terminal branches of *L. brassica*, however, are more prominent, the polyps are very large and the spiculations of the two are entirely different. In skeletal formation, *L. bournei* is nearest to *L. rhabdota* Bourne, although the flat, scalelike sclerites of *L. rhabdota* are entirely wanting in the present species. This is the commonest species of *Lemnalia* in the Puerto Galera region.

LEMNALIA BANTAYENSIS Light MS. Plate 4, fig. 2.

Colony tall, with slender stems and branches. Polyps sessile, much crowded on short terminal twigs. Sclerites of polyps spindles, of cortex crescents or bent spindles and ordinary clubs.

Colony composed of several tall, smooth, slender stems which are coalesced only for a very short distance from the base. Each main stem divides into two equal or unequal long or short but slender secondary branches which in turn give rise to the tertiary branches. Tertiaries may give rise to twigs of the fourth order or direct to terminal branches. Terminal twigs small, short, and slender, at most 12 mm long and 2 mm wide. Polyps sessile and crowded together on the terminal twigs. Sclerites of polyps and tentacles are very thin, slender spindles. Those in the polyp bodies are about 0.2 mm long; those in the tentacles are 0.05 to 0.08 mm long. Sclerites of stem cortex are crescent-shaped or bent spindles or clubs, 0.13 to 0.18 mm long and 0.02 mm wide, with few but prominent warts. Double stars or irregular sclerites are absent. In the canal walls are very numerous, simple, straight spindles, 0.2 to 0.4 mm long and 0.01 to 0.025 mm wide, with fine warts.

Colony of medium size, Light's type, No. C–248, University of the Philippines zoölogical collection, is 50 mm in total height. The type from Bantayan Island, off Cebu.

Unlike *L. philippinensis* the most numerous cortical stalk sclerites of this species are crescent-shaped forms, while the true double stars or irregular sclerites are absent. Also the polyps are crowded, unlike those in *L. philippinensis* where they are evenly and singly placed on the tertiary twigs. It has smaller sclerites than *L. flava* (May) and it differs from *L. umbellata* Kükenthal in the absence of very irregular clubs in the cortex.

LEMNALIA PHILIPPINENSIS (May). Plate 4, fig. 3.

Ammothea digitata var. *philippinensis* MAY, Jena. Zeitschr. f. Naturw. 33 (1899) 137.

Lemnalia kükenthali LIGHT MS.

Colony tall but not very slender. Polyps arranged singly or in small groups on large, prominent, terminal branchlets. Sclerites of stem cortex are crescents and double stars. Sclerites of polyps spindles.

Colony composed of several, large, tall stems that are coalesced for about one-fourth to one-half of their entire length. Each main stem gives rise to several secondary branches, which after some distance enlarge and divide into tertiaries. Tertiaries give rise to many terminal twigs 10 to 20 mm long and 2 mm wide. Polyps located on tertiary as well as on terminal twigs. They are subsessile and crowded, but may appear singly on the tertiary twigs. On the exposed part of polyps are narrow spindles 0.15 to 0.25 mm long, while those of the tentacles are also tiny spindles 0.03 to 0.05 mm long with fine warts arranged more or less transversely on the tentacles. Sclerites of stem cortex are crescent-shaped or bent spindles, 0.15 to 0.3 mm long and about 0.02 mm wide, with very fine warts and double stars, 0.05 long and 0.02 mm wide at the middle, a few of which may have long spinous rays on each star. Sclerites of the canal walls are thin spindles up to 0.55 mm long and 0.02 mm wide with fine warts.

Colony large, Light's cotype, C–244, University of the Philippines zoölogical collection, has a total height of 105 mm.

This form is nearest to *L. elegans* (May). Its cortical sclerites, however, are longer and slenderer. It differs markedly from *L. bantayensis* in having stouter and shorter secondary but longer terminal branches. May (1899) describes a badly contracted form of this species from Zamboanga as *Ammothea digitata* var. *philippinensis*. The typical species of this, however, was found to be identical with *Alcyonium flabellum* Quoy and Gaimard and was called *Lithophytum flabellum* by Kükenthal in 1903. When Kükenthal established the genus *Paralemnalia* (1913) May's typical species was named *Paralemnalia flabellum*, but *Ammothea digitata* var. *philippinensis* answers all the characteristics of the genus *Lemnalia* instead of *Paralemnalia*. Light named a similar form from Puerto Galera *L. kükenthali*, but as the older name must be used I am calling this *L. philippinensis* (May).

LEMNALIA SCASA sp. nov. Plate 4, fig. 4.

Colony slender, polyps not numerous, sessile, scattered, and rounded. Terminal branches long and very slender. Stalk cortical sclerites are modified double stars; canal wall with pointed and warty spindles. Tentacles with small spindles.

Colony composed of many slender cylindrical stems. Main stems divide below half of entire height of colony into two almost as large secondaries. Tertiaries, however, arise from different levels of the secondaries. Tertiaries give rise to twigs of the fourth order from which the very slender terminal twigs less than 1 mm in diameter are given off. Polyps sessile, globular, and scattered singly on the twigs of the fourth and fifth order, but may be more crowded towards the tips of the terminal branches. Polyps 0.5 to 0.6 mm wide and 0.4 to 0.5 mm high. In the tentacles are fine scalelike sclerites with granular surface, while in the terminal branches and bodies of polyps are fine slender spindles 0.075 to 0.12 mm long, with few warts. Stem cortex provided with modified double stars, crescents, or irregular sticks, 0.15 to 0.2 mm long and 0.01 to 0.025 mm wide with large warts. In the stalk cœnenchyma are numerous slender spindles, 0.2 to 0.43 mm long and 0.02 to 0.04 mm wide, with numerous fine warts.

Colony medium in size with a stalk diameter of 10 mm and a total height of 120 mm. Color in alcohol is light whitish yellow.

Type: No. C–5004, University of the Philippines zoölogical collection, was obtained from Puerto Galera, Mindoro.

This species is closest to *L. zimmeri* in habitus, but the mode of branching, the very slender terminal branches, and the globular polyps separate it distinctly from this species. Also the spiculation is different in the two species.

LEMNALIA ZIMMERI sp. nov. Plate 4, fig. 5.

Colony of medium size, polyps sessile, flat, and scattered on long slender terminal branchlets; tentacles with tiny sticks, cortex with clubs, spindles, and modified double stars.

From a common base several stems of different sizes arise. Each stem just below the middle of the entire height of the colony gives rise to several secondary branches at the same or at different levels. The secondary branches extend for a short distance and then divide to form the tertiaries from which the terminal twigs arise. These are usually long and slender, reaching a length of 20 mm. Polyps are sessile, flat, and scattered on tertiary and terminal twigs. They are about 0.25 mm high

and 0.55 in diameter. Terminal branches and polyp bodies are provided with simple, warty spindles with finely divided tips. Tentacles with tiny sticks with rounded tips. Stalk cortex with spiny clubs 0.2 to 0.25 mm long and 0.03 mm wide, straight or curved spindles 0.2 to 0.35 mm long and 0.04 mm wide, and a few small modified double stars, 0.01 to 0.15 mm long and 0.03 wide. Stalk cœnenchyma is provided with simple spindles, 0.3 to 0.6 mm long and 0.02 to 0.05 mm wide, with few fine warts and finely divided ends.

Type: No. C–5005, University of the Philippines zoölogical collection, has a total height of 80 mm. Color yellowish white. Collected from Puerto Galera Bay, Mindoro.

This species is named after Prof. C. Zimmer, director of the Zoölogical Museum, Berlin.

LEMNALIA FAUSTINOI sp. nov. Plate 4, fig. 6.

Colony small, with small slender stems, much branched at extreme ends. Sclerites of stem cortex are spindles. Polyps pedicelled with spindles.

Colony is composed of several small slender stems joined together only at the extreme basal portion. Each stem extends to over one-half of the entire height of the colony before giving rise to two or more secondary branches. These at once divide into tertiaries from which the terminal twigs are given off. Polyps shortly pedicelled, found either singly or in small groups on the tertiaries and terminal twigs. Free portion of polyps 0.5 to 0.6 mm in diameter and 0.5 to 0.7 mm high. Sclerites of polyps and tentacles are tiny regular spindles, 0.06 to 0.12 mm long and 0.005 mm wide, with few but prominent warts. In the terminal branches are similar but larger spindles 0.2 to 0.35 mm long with proportionally less-prominent warts. Sclerites of stalk cortex are pointed or blunt spindles, 0.13 to 0.27 mm long and 0.02 to 0.03 mm wide, with prominent warts. In the canal walls are similar but more slender spindles, 0.3 to 0.35 mm long and 0.012 to 0.018 mm wide, with less-prominent warts.

Colony small, with stems about 8 to 10 mm in diameter. Total height of type (C–5006) 50 mm. Color in alcohol pure white.

This species is closest to *L. cervicornis* (May). May's description of his species, however, is insufficient. When I examined his cotype, which is in the Berlin Museum, I found modified double stars and clubs in the cortex in addition to the spindles. In the present species no such modified double stars

or clubs are present. Also in *L. cervicornis* the exposed portion of the polyps are much longer, over twice as long as in the present form.

Locality: Puerto Galera Bay, Mindoro.

LEMNALIA LAEVIS Thomson and Dean. Plate 4, fig. 7.

Lemnalia laevis THOMSON and DEAN, Siboga Exp. 13d (1931) 77, pl. 14, figs. 7 and 8.

Colony tall, polyps stalked, separate, in terminal branches; tentacles with scalelike sclerites, cortex with crescents and stalk cœnenchyma with smooth, straight sticks with finely divided tips.

Colony tall, composed of wide base from which the coalesced tall, slightly flattened main stems arise. These extend for some distance before giving rise to secondary branches of different lengths and sizes. The tertiary branches arise closely together but at slightly different levels of the secondaries. Terminals slender but not very long. Polyps pedicelled, separate and coming out at different levels of the terminals only. Polyps 0.5 to 0.85 mm wide and 0.8 to 1.2 mm high. Terminal branches and polyp bodies with simple spindles or sticks with few prominent warts and finely divided tips, but the tentacles are provided with numerous, flat, scalelike sclerites with granular surface. Stalk cortex with modified double stars and crescent-shaped sclerites, 0.05 to 0.125 mm long and 0.02 mm wide, with prominent warts. Stalk cœnenchyma with long straight spindles or stick, 0.2 to 0.45 mm long and 0.01 to 0.02 mm wide, with finely divided tips.

Philippine material (C–5008) has a total height of 110 mm. In alcohol the colony is light yellowish brown, with very smooth stalks.

This species comes closest to *Lemnalioides philippinensis* Light in spiculation, in having the cœnenchymal sticks finely divided at the tips. The presence of numerous sclerites in the tentacles and in the stomodeal wall, places it in the genus *Lemnalia.* Also it has only one row of pinnules in the tentacles.

Previously recorded from Kaniungan Ketjil. Reef; Sulu; and Paternoster Island.

LEMNALIA GRANDISPINA sp. nov. Plate 4, fig. 8.

Colony much branched, treelike. Polyps pedicelled, with bodies and tentacles with fine spindles. Cortex of stalk with double stars; canal walls with sparsely warted spindles.

Colony composed of several stems, which are coalesced only for a short distance near the base. Each stem, at about one-half the entire height of the colony, gives rise to two or three secondary branches. These extend for some distance before giving rise to tertiary branches that come out almost from the same level. Terminal branches arise at different levels of the tertiaries, which thus appear long. Polyps are not numerous, scattered singly or in very small groups on the tertiaries and terminal branches. Polyps 0.6 to 0.75 mm wide and 0.7 to 0.9 mm high, with short pedicels but with more or less rounded ends. Sclerites of polyps as well as those of tentacles are small, almost smooth spindles. In the canal walls are spindles, 0.2 to 0.45 mm long and about 0.02 mm wide, with very few fine warts. In the stalk cortex are large double stars, 0.08 to 0.13 mm long and 0.03 mm wide at the middle, which are heavily warted at the two ends. A few modified double stars, double spindlelike, 0.16 to 0.18 mm long and 0.02 mm wide, are also seen.

Colony of medium size. The type (C–5007), from Puerto Galera, has a total height of 65 mm and main stems about 10 to 15 mm in diameter. Color in life Dresden brown.

This species approaches *L. nitida* in external appearance, but the spiculation is entirely different. In *L. nitida* the sclerites of the tentacles are flat scales with fine granular surface. Here these are tiny spindles. Also in *L. nitida* the cortical stalk sclerites are modified double stars or crescents with two long pointed rays. Here the cortical sclerites are true unmodified double stars. The species is named *L. grandispina* due to the large size of these cortical sclerites.

LEMNALIA NITIDA (Verrill).

Ammothea nitida VERRILL, Bull. Mus. Comp. Zool. Harvard 1 (1869) 39.

Colony greatly branched from base; main stems short and branched dichotomously; polyps pedicelled, separate; tentacles with scalelike sclerites with granular surface; cortex with bent spindles, irregular clubs, and modified double stars.

Colony composed of a very short base from which short stems arise. These at once divide into two more or less equal, short, thick secondary branches. Secondaries then divide into tertiaries from which the terminals are given off. Tertiaries and

terminal twigs bent or curved inwards towards center of the colony. These are numerous and crowded, giving the colony a shrubby appearance. Polyps short stalked, not in groups, but rather closely set. They are situated in tertiaries and terminals. Polyp bodies and terminal branches with fine spindles, but tentacles are provided with flat scalelike sclerites with finely granular surface. Sclerites of cortex are straight or bent spindles, 0.18 to 0.3 mm long and 0.015 to 0.02 mm wide, with prominent warts, irregular clubs 0.08 to 0.1 mm long and 0.02 mm wide at head, with prominent warts, double stars 0.05 and 0.01 to 0.02 mm wide, and modified double stars of similar size but with projecting spines, one on each side. Sclerites of canal walls are straight or slightly bent spindles, 0.25 to 0.45 mm long and 0.015 to 0.02 mm wide, with few warts.

A Philippine example (C–5009) from Puerto Galera is of medium size; total height of colony 40 mm. Color in alcohol whitish yellow with a slight greenish tinge.

Previously recorded from Zanzibar.

Genus SCLERONEPHTHYA Wright and Studer

Scleronephthya WRIGHT and STUDER, Challenger Report Zool. 31 (1889) 229.

This genus was established by Wright and Studer in 1888 on a single specimen from Philippine waters, which they called *Scleronephthya postulosa*. In 1896 the genus was provisionally united by Kükenthal with the genus *Paraspongodes*, which example was followed by May. In 1901, however, Studer gave additional reasons why *Scleronephthya* should be considered a distinct genus, and in 1901 Kükenthal, convinced of Studer's stand, accepted the genus. The following diagnosis may serve to define the genus:

Scleronephthya is a genus of Nephthyidæ in which the animals are treelike, with polyps, not provided with stützbündle, and are arranged in groups, but not in lobes. Polyp sclerites are mostly spindlelike, arranged in oblique rows basally, but horizontally around the polyp just below the tentacles to form a sort of collar. Stem with numerous narrow canals peripherally but with an irregular axislike center composed of numerous spicules packed together.

SCLERONEPHTHYA POSTULOSA Wright and Studer.

S. postulosa WRIGHT and STUDER, Challenger Report, Zoöl. 31 (1889) 229, 230, pl. 36A, figs. 2a, 2c.

Colony treelike and seemingly rigid, composed of a short stem that gives rise to large branches on two series in acute angle. These main branches in turn give off side branches in a very irregular manner. Polyps are either solitary or in groups, on the terminal twigs, main stem, or on main branches. Polyp groups much crowded on end of twigs, but widely separate on stem and larger branches. Polyp heads are club-shaped, about 1 mm long, and just as wide, at right angle with polyp stalk. They are provided with long, bent spindles, up to 0.54 mm long and 0.08 mm thick, with blunt warts. These are arranged in oblique rows in such a way that one spicule may extend half around the polyp head. In addition smaller spindles, about 0.18 mm long and 0.03 mm thick, fill the spaces between the larger spindles. Just beneath the tentacles are spindles 0.25 mm long and 0.025 mm wide, arranged more or less transversely around the polyp, forming a sort of collar. The tentacles are bent inwards, forming together an operculumlike cover over the mouth opening. On the cortex of stem and branches are spindles about 1.14 mm long and 0.1 mm wide. The canals are numerous, irregularly formed, and narrow. They are absent from the inner portion of the stem, so that here is an irregular axis composed of closely packed spindles with rounded warts and oftentimes with swollen ends.

Color in alcohol brownish gray.

Collected by the "Challenger" from a bottom with blue mud under water about 18 fathoms deep in the Visayan Sea. The above description is based on the description of Wright and Studer, as there was no material in our collection.

Genus NEPHTHEA Savigny

Nephthee SAVIGNY, Descr. de l'Egypte, Hist. nat. Suppl. 1 (1817) Atlas Polypes, pl. 2, figs. 51–57.
Nephthea AUDOUIN, Expl. pl. Savigny (1828) 49.
Neptaea BLAINVILLE, Man. d' Actinologie (1834) 523.
Nephthya EHRENBERG, Abh. Akad. Wiss. Berlin, Jg. 1832 (1834) 284.
Nephthya DANA, Zoophytes (1846) 610.
Nephthya MILNE-EDWARDS, Hist. nat. Corall. 1 (1857) 127.
Nephthya KLUNZINGER, Korallth. des Rothen Meeres 1 (1877) 33.

Nephthya STUDER, Arch. Naturg. Jg. 53 1 (1887) 19.
Nephthya (pars) DANIELSSEN, Norske Nordhavs Exp. 5 (1887) 82.
Nephthya plus *Spongodes* (pars) WRIGHT and STUDER, Challenger Report 31 (1889) 25.
Spongodes (pars) HOLM, Zool. Jahrb. Syst. 8 (1895) 24.
Spongodes (pars) KÜKENTHAL, Zool. Anz. Jg. 18 (1895) 248.
Nephthya KÜKENTHAL, Abh. Senckenb. Ges. Frankfurt 23 (1896) 89.
Nephthya MAY, Jena. Zeitschr. f. Naturw. 33 (1899) 156.
Nephthya KÜKENTHAL, Zool. Jahrb. 19 (1903) 147.

After a long mix-up in nomenclature which involves *Nephthea*, it is now certain that the type of this genus is *Nephthea chabrolii* Savigny. As a result of the findings of Ehrenberg (1834), Holm (1895), Wright and Studer (1889), and Kükenthal (1896), the genus has retained a stable position and can now be diagnosed as follows:

Species of *Nephthea* are members of the family Nephthyidæ Verrill with thin canal walls and polyps with supporting bundle, arranged in catkins or lobes.

Diagnosed as such, the genus *Nephthea* is similar to *Litophyton, Gersamia, Eunephthya, Dendronephthya, Stereonephthya,* and *Neospongodes* in having very thin canal walls. However, only the last three genera have sclerites in the polyps arranged in the form of supporting bundles. *Dendronephthya, Stereonephthya,* and *Neospongodes* differ markedly from *Nephthea* as their polyps are never arranged to form lobes or catkins. The only other genera with lobes are *Litophyton* and *Capnella.* However, neither of these has supporting bundles in the polyps; *Litophyton* has very few, if any, large sclerites in the canal walls, while *Capnella* has very numerous, heavily warted sclerites in the cœnenchymal wall.

I am using the name *Nephthea* as this is the first used by Audouin and I do not find anything wrong with it. There are no less than forty-five recognized species of this genus. Only twenty-one have been found to exist in the Philippine waters.

Key to the Philippine species of Nephthea Savigny.

a^1. Supporting bundle does not project at all or not prominently beyond polyp head.
  b^1. Polyps crowded or uniformly arranged on lobes.
    c^1. Lobes definitely longer than broad.
      d^1. Polyp sclerites not definitely larger outside than inside.
        N. columnaris Studer.
      d^2. Polyp sclerites definitely larger outside than inside.
        e^1. Basal cortical sclerites only irregular radiate forms.
          N. erecta Kükenthal.

e^2. Basal cortical sclerites with spindles.
f^1. Basal cortical spindles not more than 0.07 mm long.
N. bedfordi Shann.
f^2. Basal cortical spindles more than 0.07 mm long.
g^1. Polyp inner sclerites are small warty spindles.
N. chabrolii Audouin.
g^2. Numerous tiny smooth sclerites on inner side of polyp head and polyp stalk ..... *N. albida* (Holm).
c^2. Lobes not definitely longer than broad; semispherical or conical.
d^1. Basal cortical sclerites only irregular radiate forms.
N. australis Kükenthal.
d^2. Basal cortical sclerites with spindles and irregular radiate forms.
e^1. Polyp sclerites not arranged in definite double rows.
N. striata Kükenthal.
e^2. Polyp sclerites arranged in definite double rows.
f^1. Stem stout, tall, unbranched below.... *N. laevis* Kükenthal.
f^2. Stem short, branched from below..... *N. brassica* Kükenthal.
b^2. Polyps arranged in groups, not uniformly distributed on lobes.
c^1. Sclerites of basal cortex only spindles..... *N. nigrescens* nom. nov.
c^2. Sclerites of basal cortex spindles and irregular radiate forms.
d^1. Lobes low, more or less rounded, not definitely higher than wide.
N. quercus Kükenthal.
d^2. Lobes elongate, nearly twice as long as broad.
e^1. Inner polyp sclerites at most 0.03 mm long.
N. cupressiformis Kükenthal.
e^2. Inner polyp sclerites about 0.13 mm long.
N. amentacea Studer.
a^2. Supporting bundle projects prominently beyond polyp head.
b^1. Polyps uniformly distributed on lobes, crowded.
c^1. Lobes low or rounded..... *N. globulosa* (May).
d^1. Lobes elongate or conical.
e^1. Basal cortical sclerites only spindles with high warts on one side ..... *N. elongata* (Kükenthal).
e^2. Basal cortical sclerites spindles and irregular thorny bodies.
N. pacifica Kükenthal.
b^2. Polyps in groups on lobes, not crowded.
c^1. Basal cortical sclerites spindles and irregular thorny bodies.
d^1. Inner polyp sclerites only slightly smaller than those outside.
e^1. Spindles predominate in basal cortex.
N. debilis (Kükenthal).
e^2. Irregular radiate sclerites predominate in basal cortex.
N. ceylonensis Thomson and Henderson.
d^2. Inner polyp sclerites very tiny flat sticks about 0.07 mm long.
N. zanzibarensis Thomson and Henderson.
c^2. Basal cortical sclerites only spindles.
d^1. Inner polyp sclerites very numerous tiny sticks or rods about 0.07 mm long ..... *N. digitata* (Wright and Studer).
d^2. No such numerous tiny sticks or rods present.
N. armata Thomson and Henderson.

NEPHTHEA COLUMNARIS Studer.

Nephthya columnaris STUDER, Mittl. geogr. Ges. u. naturh. Museum Lubeck (2) Heft 7 u. 8 (1894) 125, pl. 4, fig. 2; pl. 6, fig. 4.

Polyps uniformly distributed on lobes, which are cylindrical or fingerlike; polyp sclerites, outside not decidedly larger than inside; supporting bundle does not extend beyond polyp; polyp heads not longer than broad; polyp stalk not longer than polyp head; only spindles on basal cortex.

Colonies on hand one small and one large. The larger specimen has a total height of 85 mm and the polypary has an expanse of 95 mm. Base very short, giving rise directly to several very short stems, which at once divide into two to six main branches. These in turn divide into secondaries and tertiaries, where the lobes are located. Lobes 5 to 6 mm high and 3 to 4 mm wide. Polyp heads uniformly distributed on lobes, 0.56 mm wide and 0.49 mm long; polyp stalk about 0.3 mm long. Sclerites of polyps with high prominent warts are spindles about 0.17 to 0.21 mm long. A few on the dorsal part are slightly larger. Sclerites of supporting bundle are warty spindles as much as 0.7 mm long. They are more heavily warted towards the tips. On upper cortex are slender spindles 0.49 to 0.56 mm long with fine warts. Sclerites on outer lower cortex are spindles, on the average 0.7 mm long and 0.14 mm wide, with fine warts. Those on the inner cortex are smaller, very warty spindles, 0.21 to 0.49 mm long and 0.7 mm wide, which are especially provided with high thorns on one side. In canal walls are few finely warted spindles as long as 1.3 mm and as wide as 0.21 mm, others are forked, triradiate or four-rayed.

Previously recorded from Dongala, Celebes. Philippine material was obtained from Puerto Galera Bay, Mindoro.

NEPHTHEA ERECTA Kükenthal.

Nephthea erecta KÜKENTHAL, Zool. Jahrb. 19 (1903) 154, pl. 7, fig. 8; pl. 9, figs. 45–47.

Polyps uniformly arranged on rounded lobes; sclerites of polyp head larger outside than inside; polyp head not longer than broad; polyp stalk not longer than polyp head; sclerites of supporting bundle do not protrude definitely out of the polyp head; basal cortex only with irregular, thorny or star-shaped sclerites.

Colony low, massive, and bushy with a total height of 70 mm and a polypary expanse of 80 mm. Base broad, from which

arise several short stems. These at once divide to form numerous branches on which the numerous lobes are attached. Most lobes are low and round, although a few may be elongate, 7 mm high, and 3 mm wide. Polyp heads about 0.7 mm wide and 0.6 mm to 0.7 mm long with a stalk 0.48 mm high. Sclerites on outer side of polyp head are straight or curved spindles, 0.28 mm long and 0.043 mm wide, with prominent warts. They may be irregularly arranged or in double rows, three or four in a row. Those on the inside are smaller sticks 0.06 to 0.08 mm long and 0.014 mm wide. Sclerites of supporting bundle are spindles with warts, the longest of which are 1.3 mm long and 0.11 mm wide, which may or may not extend beyond polyp head. On the cortex of lobes are long slender spindles, as much as 1.7 mm long and 0.084 mm wide, with fine warts. On the upper stem cortex are spindles on the average 0.35 mm long with prominent warts, while on the base are only small star-shaped or irregular bodies with a diameter of 0.12 mm on the average. In canal walls are stout blunt or pointed spindles, on the average 0.98 mm long and 0.21 mm wide, with fine warts.

Recorded from Tonga Island. Philippine material (C–2204) was obtained from the shallow reef on the channel between Palawan and Mataguit Islands connecting Taytay Bay and Shark's Fin Bay, Palawan.

NEPHTHEA BEDFORDI Shann.

Nephthya bedfordi SHANN, Proc. Zool. Soc. London (1912) 514, pl. 62, fig. 8; pl. 53, figs. 11, 12.

Polyps uniformly distributed on elongate lobes that are rounded at tip; polyp sclerites slightly larger outside than inside; sclerites of supporting bundle protrude very little if any beyond polyp head; polyp head longer than broad; polyp stalk longer than polyp head; inner polyp sclerites about 0.11 mm long; basal cortex with spindles and irregular radiate sclerites.

Colony low and broad, bushy in appearance. Numerous branches arise from very low stem which are covered with numerous lobes. Lobes elongate, at most 8 mm long and 3 mm wide with rounded tips. Polyps uniformly distributed around the lobes, although at places the polyp heads are not very closely crowded. Polyp head about 0.63 mm long and 0.56 mm wide, making an acute angle with a polyp stalk about 0.7 mm long. Polyp sclerites on the outside are straight or curved spindles, about 0.25 to 0.28 mm long and 0.03 to 0.04 mm

wide, with few warts. In the inner side are smaller sclerites, usually about 0.098 mm long, in the form of smooth sticks. Supporting bundle poorly developed, its sclerites not protruding beyond polyp head. The sclerites are at most 0.76 mm long. In basal cortex are spindles, at most 0.56 mm long and 0.07 mm wide, with medium-sized warts; shorter but stouter spindles 0.49 mm long 0.14 mm wide with high warts on one side, and irregular sclerites, radiate in general form, with broad rays. The latter measure about 0.12 mm by 0.17 mm. In the cœnenchyma of base are spindles 1.2 mm long and 0.17 mm wide with few low warts. A few are smaller and slenderer, 0.7 mm long and 0.07 mm wide. In addition a few triradiate smooth sclerites may be seen.

Colony in alcohol, dark dirty purplish brown.

Previously recorded from Blakang Mati, Singapore. Philippine material (C–2304) was obtained from shallow water on reefs at Pabellones Island, Palawan.

NEPHTHEA CHABROLII Audouin.

Nephthea chabrolii AUDOUIN, Expl. pl. Savigny (1828) 49.

Polyps uniformly distributed on conical, somewhat elongate lobes; sclerites of polyps decidedly smaller inside than outside; sclerites of supporting bundle do not extend beyond polyp head; polyp heads not longer than broad; in basal cortex are spindles in addition to other forms of sclerites.

Colony consists of a stout, short main stem from which short stout branches arise. These branches may either subdivide or give directly to lobes. Lobes conical, 5 to 7 mm long and 3 to 5 mm wide. Polyps closely set, 0.5 to 0.7 mm high and 0.5 to 0.7 mm wide, standing at a right angle with short stalk about 0.3 mm long. Sclerites of polyps on the outside and lateral side heavily warted spindles, about 0.2 to 0.4 mm long and 0.042 mm wide, arranged in indistinct double rows, six to eight sclerites in a row. Those situated on inside are smaller, slightly warty spindles 0.08 mm long and 0.015 mm wide. Sclerites of supporting bundle long spindles, usually about 0.8 to 0.9 mm long and 0.06 mm wide, with more warts towards one end. On upper portion of stem and on lobes are long slender finely warted spindles as long as 1.2 mm and 0.12 mm thick. On basal cortex are heavily warted stout spindles as large as 1.9 mm long and 0.26 mm thick, clubs, double stars, irregular

thorny sclerites, and other forms variously modified. In canal walls are stout, warty spindles as large as 1.3 mm long and 0.2 mm wide.

Reported from Red, Java, and China Seas, Celebes, Ternate, and New Guinea. Common on reefs at Puerto Galera Bay and Batas Island on the east coast of Palawan.

NEPHTHEA ALBIDA (Holm).

Spongodes albida HOLM, Zool. Jahrb. Syst. 8 (1895) 30–32, pl. 2, figs. 8–10.

Lobes elongate rounded at tip; polyps uniformly distributed; sclerites of polyps outside larger than inside; supporting bundle does not project beyond polyp head; polyp head not longer than wide and polyp stalk shorter than polyp head; basal cortex with spindles and irregular thorny bodies.

Colony medium in size with a total height of 50 mm and a polypary expanse of 40 mm. From a narrow base two short stems arise which branch off into primary and secondary twigs on which the lobes are located. Lobes elongate, rounded at tip, on the average 8 mm high and 3 mm wide. Polyps uniformly distributed on lobes but not crowded. Polyp head about 0.5 to 0.6 mm long and 0.7 to 0.8 mm wide at a right angle with a short polyp stalk about 0.42 mm high. Sclerites of polyp head on the outside and lateral side are spindles, 0.35 mm long and 0.03 mm wide, with scattered but prominent warts arranged in double rows about six in a row. On the inside of polyp head and stalk are numerous smooth narrow sticks about 0.05 mm long and 0.014 mm wide that are also found in the inner side of the polyp stalk. Sclerites of supporting bundle are spindles on the average 0.98 mm long, pointed, and with few warts at ends. In the basal cortex are (*a*) simple spindles, on the average 0.7 mm long and 0.11 mm wide with low warts; (*b*) smaller spindles, on the average 0.4 mm long and 0.07 mm wide, with high thorns on one side; (*c*) irregular thorny bodies on the average 0.14 mm wide and 0.17 mm high, and (*d*) other smaller bodies of various shapes and dimensions. In the canal walls are stout spindles as much as 1 mm long and 0.2 mm wide with few low warts.

Reported from Suez and Red Sea. A Philippine example (C–2015) was obtained from a cable in Legaspi Bay, just opposite the foot of Mount Mayon, 90 m deep.

NEPHTHEA AUSTRALIS Kükenthal.

Nephthea australis KÜKENTHAL, Fauna Sudwest Australiens, Alcyonaria 3 Lief. 1 (1910) 50, pl. 3, fig. 21.

Polyps arranged uniformly around low rounded lobes; sclerites of polyps outside not greater than inside; sclerites of supporting bundle do not project beyond polyp head; polyp head not longer than wide and polyp stalk much shorter than polyp head; only irregular radiate sclerites on basal cortex.

Colony very small, with a total height of 40 mm and a stalk 25 mm high and 7 mm wide. The stalk rises upwards and gives at its end a number of very short, almost invisible branches on which the lobes are located. Upper portion of stem and base of the branches are provided with fine parallel lines or grooves. Lobes very low and rounded, 3.5 mm high and 5 mm wide. Polyps closely crowded uniformly over the terminal lobes. Polyp head about 0.6 mm long and 0.4 mm wide at an acute angle with a very short hardly visible polyp stalk. Sclerites in double rows, about seven in a row, about 0.2 mm long with long warts. Some sclerites are found transversely near base of polyp heads. The few longitudinal sclerites lying between the double rows mentioned by Kükenthal in his type, cannot always be seen in this example. Supporting bundle composed of about eight sclerites, at most 1.1 mm long and do not extend beyond the polyp head. At base cortex are small irregular radiate sclerites with rounded or pointed projections. They measure 0.08 to 0.12 mm in diameter. In the cœnenchyma are weakly warted spindles as long as 1.2 mm.

Unlike Kükenthal's type, which has a reddish tinge, the Philippine example is light yellowish green.

Previously recorded from Shark's Bay, southwestern Australia. My description is based on No. C–50 with no exact Philippine locality.

NEPHTHEA STRIATA Kükenthal.

N. striata KÜKENTHAL, Zool. Jahrb. 19 (1903) 166, pl. 7, fig. 12; pl. 9, fig. 60.

Supporting bundle does not project prominently over polyp head; polyps crowded and uniformly arranged on lobes; lobes not definitely longer than broad, hemispherical or conical, basal cortical sclerites, spindles, and irregular radiate forms; polyp armature not arranged in definite double rows.

Colony low, compact, more or less like a cauliflower. Total height about 45 mm, polypary expanse 60 mm. From a nar-

row base two very short stout stems arise. These divide into two or more short stout branches, which are marked by conspicuous transverse lines, and on which the lobes are compactly arranged. Lobes low and rounded, the largest 4 mm high and 4 mm wide. Polyps crowded mostly uniformly all over the lobes. Polyp about 0.7 mm long and about the same in width, and is at right or acute angle with a very short stalk about 0.45 mm long. Polyp armatures are large, thickly laid spindles with numerous large and high thorns. They are at most 0.35 mm long and 0.07 mm wide, not definitely arranged in double rows. A few smaller and smooth sclerites are visible in the inside of the polyp heads. Supporting bundle composed of several warty spindles at most 0.85 mm long, which do not project definitely beyond polyp head. On cortex of lobes are long warty spindles as large as 1.1 mm long. On upper cortex are simple spindles 0.4 to 0.5 mm long, with very regularly arranged warts. Basal cortex is with short stout spindles 0.3 to 0.6 mm long and 0.14 mm wide with high warts on one side, irregular bodies about 0.18 mm long with numerous, compact, high thorns on one side and other smaller ones of various shapes and dimensions with rounded or pointed projections. Cœnenchymal sclerites are spindles on the average 0.98 mm long and 0.17 mm wide with few low warts.

Philippine example (C–2100) from shallow reefs near Taytay Bay, Palawan, are yellowish brown.

NEPHTHEA LAEVIS Kükenthal.

Nephthea laevis KÜKENTHAL, Alcyonaria des Roten Meeres, Pola Expedition Wien (1913) 20, pl. 2, fig. 5.

Lobes slightly rounded or conical with rounded ends; polyps uniformly distributed with sclerites of supporting bundle not extending out; sclerites of polyps slightly greater outside than inside; polyp heads longer than wide; stalk not longer than polyp head; basal cortex with spindles and irregular thorny bodies.

Colony with a stout, columnar, or tapering stem about 110 mm high and 30 mm wide near base. Stout sterile stem exposed for the most part and gives rise only to few, widely separate, short or elongate branches that do not extend far from stem axis. Lobes situated singly on sterile stem or ends of short branches. They are hemispherical or slightly conical with rounded ends, 5 to 8 mm high and 5 to 6 mm wide. Polyps uniformly distributed and much crowded on lobes. Polyp body about 0.63 mm long and 0.5 mm wide, making an obtuse angle

with its short stalk. Sclerites of polyps outside slightly larger than those inside. Those on outside and lateral side are double rows, about six in a row, 0.18 to 0.2 mm long with prominent but widely separate thorns. Those on inside are flat sticks about 0.07 mm long with few low lateral warts. Supporting bundle composed of about eight spindles, the longest about 0.84 mm long with prominent warts, which do not protrude beyond polyp head. Cortex of upper stem and branches with spindles as long as 0.4 mm with regular high separate warts. At basal cortex spindles become larger, 0.5 mm long, with higher thorns, especially on one side. These are mixed with few irregular thorny bodies. In cœnenchyma are stout spindles as large as 1.05 mm long and 0.196 mm wide with few low warts.

Recorded from Djidda, Red Sea. The Philippine example (C–54) has no exact locality record.

NEPHTHEA BRASSICA Kükenthal.

Nephthea brassica KÜKENTHAL, Zool. Jahrb. Syst. 19 (1903) 165, pl. 7, fig. 1; pl. 9, figs. 57–59.

Polyps arranged uniformly in groups on more or less conical lobes; polyp heads not longer than wide; polyp stalk shorter than polyp head; polyp sclerites larger outside than inside; supporting bundle extends very little, if at all, beyond polyp heads; polyp sclerites four to five double rows; basal cortical sclerites spindles and irregular spinous bodies.

Colony low and wide. From a wide base one or more very short stems arise that directly divide into numerous short low branches on which the lobes are located. Lobes slightly rounded, but higher than broad, about 8 mm high and 5 mm wide. Polyps small, with short stalk, arranged in large groups around the lobes. Polyp head about 0.56 mm long and about the same in width. Polyp stalk very short, about 0.3 mm long. Sclerites of polyp on outer and lateral sides are straight or bent spindles as long as 0.23 mm, with many large prominent warts, four to five in the double rows. On the inner side the sclerites are slightly smaller, about 0.15 mm long, flat sticks with fewer and less-prominent warts. Sclerites of supporting bundle are spindles about 1 mm long with fine warts. Most of these adhere close to the dorsal side of the polyp heads. On basal cortex are stout spindles, 0.4 to 0.5 mm long, with many large branched spines, especially on one side, and irregular spinous bodies about 0.14 mm in diameter. Some irregularly branched spindles are

also found. In cœnenchyma are large stout spindles, about 1.5 mm long and 0.22 mm wide, with fine warts. These spindles may oftentimes be forked or branched, three-rayed or four-rayed.

Previously reported from Tonga Island. Philippine material from Puerto Galera Bay, Mindoro, in the Berlin Zoölogical Museum.

NEPHTHEA NIGRESCENS nom. nov.

Spongodes nigra KÜKENTHAL, Zool. Anz. (1895) 429.
Nephthya nigra KÜKENTHAL, Zool. Jahrb. 19 (1903) 152.

Polyps in small groups on lobes, which are long and pointed; polyp sclerites on the outside much larger than those on the inside; polyps seemingly as wide as they are high, standing at a right angle with a short stalk; cortical sclerites only spindles.

Colony upright and much branched. From a short sterile base, a medium high stalk arises. This gives off numerous branches on which the lobes are situated. Lobes rather long and pointed, about 9 mm long and 5 mm wide. The polyps are closely set on the apex of the lobes, but lower down, they are arranged in small groups. Polyps of medium size, about 0.7 mm high and 0.8 mm wide, making a right angle with a short stalk about 0.5 mm long. Polyp sclerites on the outside are in double rows, about five in a row, each about 0.2 mm long. Laterally and on the inside the sclerites are small sticks only about 0.08 mm long. Supporting bundle composed of about six spindles, the largest of which is about 0.9 mm long and does not protrude prominently beyond polyp head. Stem cortical sclerites are compact looking, strongly warted spindles about 0.9 mm long. In the canal walls are similar but slightly longer sclerites as long as 1.2 mm.

Color in alcohol blackish or dirty brown. The name *N. nigra*, as used for this species, is preoccupied.

Reported from Ternate. Philippine material was collected from Puerto Galera Bay, Mindoro.

NEPHTHEA QUERCUS Kükenthal.

Nephthya quercus KÜKENTHAL, Alcyonaria, Fauna Sudwest Australiens 3 Lief. 1 (1910) 47, pl. 2, fig. 14.

Supporting bundle does not protrude beyong polyp head; polyps arranged in groups, not uniformly distributed on lobes; sclerites of basal cortex spindles and irregular radiate bodies; lobes low, more or less rounded, not definitely higher than wide.

Colony low and wide, bushy in appearance. Total height of colony 60 mm with a polypary expanse of 90 mm. From a wide base, one or two short wide stalks arise. These almost at once divide to form numerous branches that subdivide into several short terminal twigs on which the numerous and small densely crowded lobes are located. Lobes rounded, about 4 to 6 mm high and 4 to 5 mm wide with rounded ends. Some may be conical. Polyps very small, seemingly densely crowded, but at places appear in groups. Polyps slightly longer than wide at times, although usually they are 0.5 mm long and 0.5 mm wide with short polyp stalk. Sclerites of polyp heads are large, curved or straight spindles in close double rows, five to seven in a row. They are about 0.28 mm long and provided with prominent, widely separate warts. A few sclerites that are not always seen, are present on the inner side. Supporting bundle sclerites at most 0.84 mm long and do not protrude beyond polyp head. Basal cortex with few stout spindles with high simple or branched warts, on the average 0.48 mm long and 0.08 mm wide, and numerous irregular spinous bodies of various shapes.

A Philippine example (C–2454), obtained from Small Balatero Cove, Puerto Galera, Mindoro, does not possess the typical coloration of the one described by Kükenthal.

NEPHTHEA CUPRESSIFORMIS Kükenthal.

N. cupressiformis KÜKENTHAL, Zool. Jahrb. 19 (1919) 153, pl. 7, fig. 7; pl. 9, figs. 40–44.

Lobes elongate, with polyps arranged in small groups; polyp head longer than wide; polyp stalk longer than polyp head; supporting bundle does not extend beyond polyp head; basal cortex with spindles and compact, irregular bodies.

Colony small and slender with a total height of 58 mm and a polypary expanse of 14 mm. The stem rises to about 30 mm before giving off short, slender, side branches. The polyps are in small groups, about five to seven in a group, on elongate lobes 6 to 10 mm high and 2 to 3 mm wide. Polyps with heads about 0.63 mm long and 0.56 mm wide at a right angle with a high stalk about 0.7 mm long. Polyp sclerites on the outside are spindles about 0.21 mm long with prominent warts arranged in double rows of about four in a row. Those on the sides are also spindles, but smaller, about 0.14 mm long. At

places they may be in double rows with as many as ten in a row. Sclerites on the inside are smooth sticks 0.028 mm long, without any special arrangement. Supporting bundle composed of six to seven spindles, at most 0.9 mm long, with widely separated warts. One or two of these may extend beyond the polyp head, although in most cases none of them does so. Sclerites of cortex are spindles 0.5 to 0.8 mm long and about 0.07 mm wide with high thorns on one side. At the extreme base the spindles are shorter, about 0.3 mm long with very high thorns, mixed with compact bodies 0.10 mm wide and 0.15 mm high with pointed projections. In the canal walls at base are spindles as large as 2.5 mm long and 0.35 mm wide with thickly set warts. Higher in the stem the spindles are much smaller and approach those of the cortex in size and appearance.

Previously reported from Palau Island. Philippine material (C–291) was obtained from Puerto Galera, Mindoro.

NEPHTHEA AMENTACEA Studer.

N. amentacea TH. STUDER, Mitth. geogr. Ges. und naturh. Mus. Lubeck (2) Heft 7 u. 8 (1894) 123.

Polyps in close groups all over elongate, fingerlike lobes; polyps cup-shaped, not longer than wide; polyp stalk longer than polyp head; sclerites of polyps slightly larger outside than inside; sclerites of supporting bundle do not protrude beyond polyp head. On basal cortex are spindles with high warts on one side and other sclerites.

Colony small. A main stem arises from the base and divides into a number of short branches on which the lobes are located. Lobes elongate, fingerlike, on the average about 7 mm high and 4 mm wide. Polyps arranged in groups, as many as six in a group, the groups not arranged in transverse rows on lobes. Polyp heads about 0.56 mm long and 0.7 mm wide, forming an acute or a right angle with the polyp stalk, which is slender, about 6 mm long. Sclerites in polyp head slightly larger outside than inside. Those on the outside and lateral sides are sticks about 0.21 mm long with prominent warts, in double rows of five to six. On the inner side, polyp sclerites are smaller, about 0.13 mm long, with less-prominent warts. Sclerites of supporting bundle composed of about six spindles that do not protrude beyond the polyp head. Most of them are about 0.7 mm long although a few may be much longer. In stem cortex

are spindles as much as 0.6 mm long and 0.06 mm wide with simple warts, smaller but thicker spindles about 0.25 mm long with high branched warts, especially on one side, and modified spindles, three-rayed or four-rayed sclerites. In the cœnenchyma are simple low-warted spindles 0.5 to 0.7 mm long and 0.07 to 0.11 mm wide.

Previously reported from Sulu Island (Philippines). The material in hand (C–306 and C–278) was obtained from the shallow reefs in Puerto Galera Bay, Mindoro.

NEPHTHEA GLOBULOSA (May).

Spongodes globulosa MAY, Jena. Zeitschr. f. Naturw. 33 (1899) 167.

Polyps uniformly distributed on rounded lobes. Polyp head not longer than wide; polyp stalk not longer than polyp head; sclerites of polyps larger outside than inside; sclerites of supporting bundle protrude prominently beyond polyp head. Cortex only with spindles.

Colony large, low, and spreading. From a wide base two short main stems arise, which at once divide to form numerous branches on which the lobes are densely crowded. Lobes of various dimensions, rounded, but not low. The majority are 6 mm high and 5 mm wide, although some are very high and others very low. Polyps uniformly distributed on lobes. Polyp head at a right angle to polyp stalk. Polyp stalk about 0.35 mm high; polyp head is about 0.42 mm long and 0.6 to 0.7 mm wide. Sclerites of polyp head are spindles about 0.28 to 0.3 mm long and 0.028 to 0.03 mm wide, with prominent high warts in double rows of four to five in a row. On the inner side, sclerites are smaller sticks about 0.07 mm long with less-prominent warts. Supporting bundle well developed, consisting of about eight sclerites which may grow as long as 1.8 mm with prominent warts, two or more of which extend beyond polyp head. In the cortex of the branches are spindles as long as 1.3 mm and 0.12 mm wide with prominent warts. At the base the spindles are shorter, on the average about 0.7 mm, but with longer warts. Cœnenchymal sclerites are also spindles, but with very low warts. In the branches they are very slender, 1.2 mm long and 0.07 mm wide, while at the base they are thick, about 1.7 mm long and 0.28 mm wide.

Recorded from the South Sea. Philippine material (C–2149 and C–2112) was obtained from Taytay Bay, Palawan.

NEPHTHEA ELONGATA (Kükenthal).

Spongodes elongata KÜKENTHAL, Zool. Anz. (1895) 429.

Polyps uniformly distributed on conical lobes that are rounded at tip; supporting-bundle sclerites extend beyond polyp head; sclerites of polyp head slightly larger outside than inside; no transverse sclerites found on polyp head.

Colony small with a rather stout stem. This gives off two or three short branches on which lobes are located. Lobes slightly elongate, conical, rounded at tip, 5 to 6 mm high and 3 mm wide. Polyps uniformly distributed all over lobes. Polyp head not longer than wide and polyp stalk shorter than polyp head. Polyp head about 0.4 to 0.5 mm long and just as wide. Polyp stalk about 0.3 mm high. Sclerites of polyps on outer and lateral sides in double rows, six in a row, about 0.25 mm long and 0.042 mm wide, with prominent warts. Those on the inner side are slightly smaller, at most 0.098 mm long. Supporting bundle composed of six long-warted spindles, reaching 1.4 mm in length. One or two of these extend slightly beyond polyp head. Sclerites of basal cortex are spindles, 0.4 to 0.7 mm long and about 0.08 to 0.1 mm wide, with high simple warts. In addition are shorter, stouter spindles, about 0.18 mm long and 0.07 mm wide, with many branched spines on one side. In the outer cœnenchymal walls are simple spindles, smooth looking with few warts, about 0.42 mm long and 0.07 mm wide. Many of these are branched, forked, or four-rayed, etc. In the inner cœnenchyma of base are stout spindles, 0.98 to 1.3 mm long and 0.12 mm wide, with low small warts.

Reported from Ternate. Philippine material (C–2091) has no exact locality recorded.

NEPHTHEA PACIFICA Kükenthal.

N. pacifica KÜKENTHAL, Zool. Jahrb. Syst. 19 (1903) 158.

Polyps uniformly distributed on elongate fingerlike lobes; polyp sclerites decidedly larger outside than inside; one or more sclerites of supporting bundle project beyond polyp head; large transverse sclerites present between the smaller sclerites in double rows.

Colony rigid, small or large. Several stems arise from a common base; main stems divide into two or more large branches on which the lobes arise. Sometimes, however, tertiaries are given off on which the lobes are located. Lobes elongate,

as large as 10 mm high and 6 mm wide. Polyps crowded, with stalk 0.5 mm long and head 0.5 mm high and 0.8 mm wide. Polyp sclerites spindles about 0.24 mm long and 0.025 mm wide with few prominent warts. Under these are smaller, almost smooth, sclerites arranged in double rows. On inner side of polyps are still smaller, short, tiny sticks irregularly disposed. Supporting bundle well developed, composed of six to ten sclerites, usually 0.8 mm long and 0.04 mm wide, although a few may be much longer, at most 1.4 mm long. In basal cortex are short stout spindles, 0.4 to 0.6 mm long and 0.05 to 0.1 mm wide, with fine warts. Under these are small but much more heavily warted spindles especially on one side where high branched thorns are present. These are 0.3 to 0.6 mm long and 0.08 mm wide, exclusive of spines. Among these are small, high thorny, irregular bodies about 0.12 mm in diameter. In cœnenchyma are large, massive, straight or bent spindles, 1.6 mm long and 0.25 mm wide, with many fine closely set warts.

Reported from Viti Island (Pacific Ocean). Philippine material (C–2110) was obtained from shallow-water reefs near Taytay, Palawan.

NEPHTHEA DEBILIS (Kükenthal).

Spongodes debilis KÜKENTHAL, Zool. Anz. (1895) 431.

Polyps arranged in groups on elongate lobes, but groups are not in transverse rows; supporting-bundle sclerites extend slightly beyond polyp head; polyp head not longer than wide; polyp stalk shorter than polyp head; sclerites of polyp head smaller inside than outside; sclerites in double rows, five to six in a row.

Colony tall. Polyps in groups on elongate lobes situated on small terminal branches and on side branches. Lobes on the average 11 mm long and 5 mm wide, although many are shorter and more rounded. Polyp groups are not in transverse rows. Polyp head about 0.6 to 0.7 mm wide and 0.42 mm long at an obtuse angle with the polyp stalk, which is about 0.39 mm high. Sclerites on outer side of polyp head are 0.28 to 0.3 mm long with prominent warts, in double rows, five to six in a row. Sclerites on inner side are small sticks, at most 0.14 mm long. Supporting bundle composed of about ten warty spindles, which may grow as long as 1.2 mm. Sclerites of upper cortex are spindles, at most 0.49 mm long and 0.084 mm wide, with coarse but seemingly high warts, especially on one side. At the base

the cortical sclerites become shorter and thicker with numerous high thorns on one side, as well as irregular very thorny sclerites. Cœnenchymal sclerites are stout spindles with low warts. The largest of these are 1.5 mm long and 0.21 mm wide.

Recorded from Ternate. Philippine material (C–315) was obtained from the shallow reefs in Puerto Galera Bay, Mindoro.

NEPHTHEA CEYLONENSIS (Thomson and Henderson).

Nephthya chabrolii var. *ceylonensis* THOMSON and HENDERSON, Alcyonaria, Rep. on Pearl Oyster Fisheries Manaar, Supp. Rep. 20 (1905) 275.

Polyps arranged in groups on elongate, fingerlike lobes. Polyp head not longer than broad; stalk of polyps not longer than polyp head; sclerites of polyp head outside slightly larger than those inside; sclerites of supporting bundle protrude decidedly beyond polyp head.

Colony bushy, with a total height of 70 mm, and the polypary with a total expanse of 55 mm. Main stem very short, which at once divides into two main branches on which the side branches arise. Lobes numerous and crowded, elongate, fingerlike, on the average 10 mm high and 4 mm wide. Polyps single or in small groups all over lobes and not crowded. Polyp head 0.7 to 0.9 mm wide and 0.56 mm long at a right angle with a very short stalk 0.56 mm high. Sclerites on outer and lateral sides are spindles 0.25 to 0.3 mm long with very large, widely separate warts, arranged in double rows, five to six in a row. Those on the inner side are slightly smaller, about three to four in a row. Supporting bundle well developed, composed of long spindles at most 1.50 mm long, especially warty at the middle. Cortex of branches and lobes with slender spindles as large as 1.05 mm long and 0.11 mm wide. Sclerites of base cortex are mostly irregular or star-shaped spinous bodies at most 0.14 mm wide and 0.21 mm high. In addition a few spindles are found. Some of these are short and thick, 0.56 mm long and 0.14 mm wide, with high branched thorns on one side, while others are as much as 0.91 mm long and 0.12 mm wide, with high warts also on one side. In the cœnenchymal wall are stout spindles at most 1.12 mm long and 0.21 mm wide with low warts. The majority, however, are much smaller and smoother. Many are triradiate or four-rayed.

Reported from Gulf of Manaar. Philippine material (C–2149) was obtained from Pabellones Island, at the mouth of Taytay Bay, Palawan, and (C–2119) from reefs near Taytay.

NEPHTHEA ZANZIBARENSIS Thomson and McQueen.

N. zanzibarensis THOMSON and MCQUEEN, Journ. Linn. Soc. 31 (1908) 59.

Polyps arranged in groups on elongate lobes, but groups are not arranged in transverse rows; polyp head not longer than wide and stalk shorter than polyp head; sclerites of polyp heads larger outside than inside; sclerites of supporting bundle extend prominently beyond polyp head.

Colony low, bushy in appearance. Stem very short and gives rise close at the base to four branches that in turn divide into numerous short branchlets on which the lobes are thickly crowded. Lobes even arise near base of main branches. Lobes elongate, cylindrical, and slender, on the average 12 mm long and 3 mm wide. Polyps arranged in definite groups of four or more, but the groups are not arranged in transverse rows. Polyp heads about 0.7 mm long and 0.84 mm wide in an acute angle with a short stalk 0.56 mm high. Sclerites on polyp head in double rows of more than eight in a row. These are spindles about 0.18 mm long with few but large warts. Sclerites on the inside of polyp head and stalk are numerous flat sticks about 0.07 mm long. Supporting bundle composed of six to seven spindles as long as 1.2 mm, with fine warts. Sclerites of cortex of branches are spindles, on the average 0.42 mm long, with high thorns, mixed with smaller spindles, 0.25 mm long, with fewer and lower warts. At the base the sclerites transform into irregular highly spinous bodies, on the average 0.17 mm in diameter. A few spindles similar to those higher in the stem are also found. In the cœnenchyma are smooth, pointed spindles of various sizes. Sclerites are present in the tentacles, contrary to what has been said about the type of Thomson and Henderson.

Philippine material (C–2216) was obtained from shallow reefs at Batas Island, on the east coast of Palawan, and (C–278*a*) from Puerto Galera Bay, Mindoro.

NEPHTHEA DIGITATA (Wright and Studer).

Spongodes digitata WRIGHT and STUDER, Challenger Report 31 (1889) 193, pl. 36, figs. 2*a*, 2*b*.

Polyps in small groups on lobes; lobes longer than broad; one or more sclerites of supporting bundle extend beyond the polyp head; polyp stalk longer than polyp head; polyp groups not arranged in transverse rows on lobes.

Colony low, wide and bushy in appearance. From a common base two or more stout stems arise. These stems give rise at different levels to many short branches on which the lobes arise. Lobes elongate, about 10 mm high and 6 mm wide, more or less pointed at end. Polyps in small groups on lobes, not closely set, and diverging on all sides. Polyp head stands at a right angle with polyp stalk. Polyp head about 0.98 mm wide and 0.42 mm wide, while polyp stalk is about 0.77 mm long. Sclerites of polyps on outer and lateral sides are straight or bent spindles, about 0.28 mm long, with rather prominent warts. They are arranged in four or five converging double rows. On inner side of polyp are very numerous tiny, flat, smooth sticks about 0.07 mm long, densely packed together. Supporting bundle composed of five or more spindles with fine warts which may grow to 1.5 mm long. One or more project beyond polyp head. On basal cortex are only warty spindles which may be as large as 0.98 mm long and 0.084 mm wide. In cœnenchyma are stout low-warted spindles as large as 1.5 mm long and 0.22 mm wide. In life the main stem is drab with a tinge of lilac, polypary smoky.

Recorded from reefs off the coast of Cebu, Philippines. The most-abundant form at Puerto Galera Bay, Mindoro, found in water between 10 and 25 meters deep.

NEPHTHEA ARMATA Thomson and Henderson.

N. armata THOMSON and HENDERSON, Proc. Zool. Soc. London (1906) 422, pl. 27, fig. 4.

Polyps arranged in very small groups of threes or fours, which are more or less in transverse rows on very long, slender, fingerlike lobes; tips of sclerites of supporting bundle smooth; polyp sclerites at most 0.5 mm long.

Unlike Thomson and Henderson's type the colony is large, with a total height of 100 mm and an expanse of 80 mm. Colony consists of one long main stem, which gives rise to numerous branches, three or four of which may be given off at one level. Main branches divided into secondaries and tertiaries where lobes are located. Lobes slender, at times reaching a length of 11 mm and a width of 3 mm. Polyps on lobes in groups of threes or fours, the groups somewhat widely separate. Polyp heads shorter than wide and polyp stalk longer than polyp head. Sclerites of polyp head short and stout spindles arranged in double rows with coarse warts, usually about

0.3 to 0.5 mm long. Supporting-bundle sclerites four to five, usually about 0.8 mm long with smooth ends, one or more of which may project beyond polyp head. Sclerites of cœnenchyma of lobes are long, finely warted sclerites, 1 to 1.4 mm long and 0.06 to 0.08 mm wide. Cœnenchymal sclerites of base but few large spindles about 1.5 mm long and 0.18 mm wide. Cortical sclerites of base are heavily warted spindles, 0.4 to 0.7 mm long and 0.08 to 0.1 mm wide. On the inner cortex are numerous warty spindles, 0.4 to 0.9 mm long and 0.08 to 0.1 mm wide, with many high branched spines on one side.

Reported from Zanzibar. Philippine material (C-2149) was obtained from Puerto Galera Bay, Mindoro.

Genus DENDRONEPHTHYA Kükenthal

Dendronephthya KÜKENTHAL, Zool. Jahrb. Syst. 21 (1905) 526.
Dendronephthya SHANN, Proc. Zool. Soc. London (1912) 518.

The greater bulk of the species now included under this genus formerly belonged to the genus *Spongodes*, which all workers used until 1905. The genus *Spongodes*, based on *Spongodes celosia* as type, was established by Lesson in 1834. In 1846, however, Dana, without any apparent reason, changed the name to *Spoggodia*, under which he included, in addition to *Spongodes celosia* and a new variety *Spongodes celosia* var. *arborescens*, *Alcyonium floridum* of Asper. Gray in 1859 at first included *Spoggodia* under *Nephthea*, but in 1862 accepted it as a valid genus and divided it into the subgenera *Spoggodes* and *Spoggodia*. Wright and Studer (1899) used the name *Spongodes* and divided it into Spicatæ, Glomeratæ (*Spoggodes* of Gray), and Divaricatæ (*Spoggodia* of Gray). Most of the Spicatæ of Wright and Studer are now ranked under the genus *Nephthea*. Holm (1895), while contributing much to the knowledge of the group, would not separate *Spongodes* from *Nephthea*. He used *Spongodes* as the generic name and divided it into four subgenera; namely, *Nephthea*, *Panope*, *Spongodia*, and *Spongodes*. In 1896, Kükenthal definitely established the difference between *Nephthea* and *Spongodes* and divided the latter into the two subgenera *Spongodes* and *Spongodia*. Later both Holm and Kükenthal felt the need of elevating *Spongodia* from the rank of a subgenus to that of a genus. This was done by Kükenthal in 1905, but to avoid confusions and to follow the International Rules of Nomenclature promulgated in that year

he discarded *Spongodes* and gave the genus a new name, *Dendronephthya*. The name *Spongodes* could not be retained, as the type of Lesson, *S. celosia,* is a species of *Nephthea*. *Spongodia,* as first used, was synonymous with *Spongodes*. Thus Kükenthal also dropped it and used the new name *Stereonephthya* instead.

The difficulty of working out any collection of *Dendronephthya* lies in the enormous number of species of the group which differ from one another only in very minute characters. Kükenthal (1905), in his revision of the family Nephthyidæ, enumerated and described in detail no fewer than eighty-seven species; and Henderson (1909), in working out the alcyonarians of the Indian Ocean, described another series of sixty species, all said to be different from those described by Kükenthal and previous workers. Kükenthal (1910), in working out the Michaelsen-Hartmeyer collection from southwestern Australia, described one new species and two new varieties, and in 1911 he described four other species and one variety. Finally, in 1922, Sherriffs, working out the *Dendronephthya* of the Siboga Expedition, gave an excellent treatise on the genus, promulgated the very useful "anthocodial grade and formula" system, and described three additional new species. Such an enormous number of species within a genus makes it very unwieldy. Such being the case, several workers with whom I have been personally in contact are of the opinion that the genus *Dendronephthya* should be divided into three distinct genera. This plan is worth while considering as there are sufficient differences among the three groups within *Dendronephthya* (Glomeratæ Divaricatæ, and Umbellatæ) ; just as there are between *Dendronephthya* and *Stereonephthya*. I shall not be surprised if in five or ten years from now some one finds sufficient courage to put this plan into practice.

The genus *Dendronephthya* is usually defined to include all Nephthyidea with bushlike or branched appearance whose polyps are always provided with supporting bundles and always appear in groups or bundles. In *Nephthea* the polyps are always arranged in lobes or catkins, while in *Stereonephthya* the polyps usually arise singly directly from the stalk, main branches, or twigs, never forming groups, bundles, or lobes.

Following the example of recent workers on this genus, I am using the three main groups, Glomeratæ, Divaricatæ, and Umbellatæ. The definition of these groups is included in the key.

To facilitate the use of the specific descriptions of the various species, I explain here the terms most commonly used in the diagnosis of the species.

Anthocodial sclerites.—These sclerites are usually in eight double rows, extending from the basal to the apical portions of the polyp heads. In certain cases, however, there may be only five or six double rows, the two or three double rows situated ventrally—that is, on the inner side of the polyp head—may be absent. The sclerites in a double row are designated by the term "point sclerites." It is taken for granted in this paper that species with more point sclerites are more primitive than those in which there are less. Point sclerites may all be of the same size and shape. In the case of the more highly developed species, however, one or both of the outer point sclerites (towards the apical end of the polyp head) in a double row may be much larger than the rest and may project for some distance beyond the base of the tentacles. Following Sherriffs, I am designating the larger sclerites as *P* and the smaller, *p*.

Crown sclerites.—When there are numerous point sclerites (four or more in a row) they are only the ones found on the polyp head proper. In cases, however, where there are only very few of them (three or less in a row), some sclerites are present, lying more or less horizontally at the base of the polyp head. These are usually in two or three rows and do not form a part of the double rows of anthocodial sclerites. These are called "crown sclerites" and are designated as *Cr.* Species with crown sclerites are assumed to be phylogenetically higher than species without them.

Supporting bundle.—I am using this term in place of the German word "Stützbundel;" it is usually abbreviated as S.B. The term denotes a group of well-developed sclerites located on the external (dorsal) side of the polyp stalk. In the majority of cases the supporting bundle is composed of few very large spindles, one or several of which may extend for a distance beyond the external angle formed by the polyp stalk and polyp head. In some cases, however, the sclerites composing the bundle are small when they cover a wide portion of the stalk base and converge apically into a point. Such a supporting bundle is called "ensheathing" in type. A supporting bundle composed of few but very large sclerites is said to be "strong" and is considered more highly developed than one with numerous but small sclerites, called "weak."

Accessory sclerites.—I use this term to denote few or many small or medium-sized sclerites sometimes present on the internal (ventral) side of the polyp stalk.

Intermediate sclerites.—These are one or two pairs of very small sclerites between the double rows of anthocodial sclerites and may be seen just below and between the bases of the tentacles. Oftentimes they are not easily discernible.

Foliaceous branches.—In many species of *Dendronephthya* two or more of the lowest branches are much flattened, arched, and directed ventrally. Sometimes they form a complete ring or collar all around the stalk, marking the boundary between the sterile stalk and the polypary.

The polyp stalk is said to be "short" when it is about 1 mm long or shorter. It is "long" when it is about 2 mm high.

Sherriffs (1922) has adopted his "anthocodial grade and formula," which I have found very useful. The formula, together with the description of the habitus and branching and the type of sclerites found in the branches and stalk, enables one to locate just about where a specimen lies in the complex system of species in a group.

Sherriffs has reduced all of the species to six anthocodial grades, depending upon the number and differentiation of point sclerites and the presence or absence of crown sclerites. As has been said previously, the ones with more numerous point sclerites and without crown sclerites are considered more primitive than those with fewer point sclerites and with well-developed crown sclerites. The following are the various anthocodial grades:

Grade I.—Each point composed of very numerous small sclerites, usually all of the same size. The number in a row may be eight to twelve or sometimes many more. Crown sclerites absent.

Grade II.—Each point composed of six to eight pairs of sclerites. They are usually medium and uniform in size. Crown sclerites absent.

Grade III.—Each point composed of four to six pairs, the outermost pair somewhat more developed, although not projecting out of the polyp head. Crown sclerites absent.

Grade IV.—Each point composed of four to five pairs of rather large sclerites, one or both of the outermost much larger and projecting out of the polyp head. Crown sclerites absent.

Grade V.—Each point composed of three pairs only, one or both of the outermost being much longer, stronger, and project-

ing definitely beyond polyp head. Two or three rows of crown sclerites present.

Grade VI.—Each point composed of only one pair of large, strong, and decidedly projecting sclerites. Two or three rows of crown sclerites. In some cases there are one or two pairs of very tiny intermediate sclerites between the rows of point sclerites.

I. GLOMERATÆ

This group includes all species in which the colony is only slightly branched or, when much branched, the branches stout and usually hidden by polyp groups. The polyps are in groups which in turn form closely set rounded bunches giving the colony an irregular external surface.

a^1. Point sclerites of polyp head more on outer (dorsal) rows than on lateral.
  b^1. Crown sclerites present (on ventral only).... *D. guggenheimi* sp. nov.
  b^2. Crown sclerites absent.
    c^1. Very few, if any, sclerites on ventral side of polyp head. *D. moseri* sp. nov.
    c^2. Numerous small sclerites on ventral side..... *D. fusca* (Studer).
a^2. Point sclerites equal all around polyp head.
  b^1. Crown sclerites absent.
    c^1. Some point sclerites project out of polyp head.
      d^1. Polypary not flattened.
        e^1. Colony low, with short sterile stalk and prominent side branches.
          f^1. All outermost point sclerites project out slightly. *D. gigantea* (Verrill).
          f^2. Only outermost point sclerites of lateral rows project decidedly ..... *D. spinifera* (Holm).
        e^2. Colony tall and columnar with very short side branches. *D. roemeri* Kükenthal.
      d^2. Polypary flattened laterally..... *D. aculeata* Kükenthal.
    c^2. No point sclerites project beyond polyp head. *D. hicksoni* (Kükenthal).
  b^2. Crown sclerites present..... *D. semperi* (Studer).

II. DIVARICATÆ

This group includes all species with a profusely branched polypary. The branches are usually very long and slender and the polyp bundles are at the ends of small, slender, terminal twigs, although these are not always on the surface of the polypary. In most cases the branches are so located and directed as to give the polypary a uniform contour. A great many of the Divaricatæ have the polypary flattened laterally.

a^1. Crown sclerites absent.
  b^1. Polyp stalk very short (less than 1 mm)..... *D. griffini* sp. nov.
  b^2. Polyp stalk slender.
    c^1. Polyp stalk about 2 mm; point sclerites six to eight in a row.
D. microspiculata (Pütter).
    c^2. Polyp stalk about 2 mm; point sclerites five in a row.
D. divaricata (Gray).
a^2. Crown sclerites present.
  b^1. Polypary not flattened laterally..... *D. radiata* Kükenthal.
  b^2. Polypary flattened laterally.
    c^1. Polyp stalk long.
      d^1. Polypary with uniform contour..... *D. pütteri* Kükenthal.
      d^2. Polypary without a uniform contour.
D. cervicornis (Wright and Studer).
    c^2. Polyp stalk short.
      d^1. Polypary with an oval outline..... *D. gracillama* Kükenthal.
      d^2. Polypary with an irregular outline..... *D. flammea* Sherriffs.

III. UMBELLATÆ

This group includes all species whose polypary is so branched that all terminal twigs are in umbellike or corymblike groups, the heads of the umbels being formed by the bundles or groups of polyps. Here most of the polyp groups are on the outer surface of the polypary.

a^1. No point sclerites project beyond polyp head.
  b^1. Umbels form hemispherical groups.
    c^1. Sclerites of supporting bundle extend beyond polyp head.
D. repens Kükenthal.
    c^2. No sclerites of supporting bundle extend beyond polyp head.
D. manyanensis sp. nov.
  b^2. Umbels do not form hemispherical groups.
    c^1. Accessory sclerites present on inner side of polyp stalk.
D. brevirama (Burchardt).
    c^2. No accessory sclerites on ventral (inner) side of polyp stalk.
D. florida (Esper).
a^2. Some outer point sclerites project out of the polyp head.
  b^1. Stalk of colony tall and columnar.
    c^1. Lower branches not foliaceous.... *D. anguina* (Wright and Studer).
    c^2. Lower branches foliaceous..... *D. malaya* sp. nov.
  b^2. Stalk of colony short.
    c^1. Lower branches not foliaceous..... *D. rubra* (May).
    c^2. Lower branches foliaceous..... *D. umbellata* (Wright and Studer).

I. GLOMERATÆ

DENDRONEPHTHYA GUGGENHEIMI sp. nov. Plate 2, fig. 4; Plate 5, fig. 1.

Glomerate, with a short stalk and numerous short or long stout branches; polyps in small crowded groups on stem and in

large rounded lobelike groups on sides and ends of branches; polyp stalk very short; anthocodial armature two to eight in a row, none extending out; more on outer than on lateral and inner sides; crown sclerites only on inner side of the polyp head; formula:

$$II = 2\text{–}8\ p + 2\ Cr\ \text{(on ventral only)} + \text{medium S.B.}$$

Colony low and bushy. Stalk very short, giving out at once numerous slender or stout branches at different levels. Lower branches not foliaceous. Polyps in small but crowded groups on stem, but at branches, especially at their ends, they are in large rounded groups. Polyps more or less conical in shape, about 1.2 mm long and 0.8 mm wide, making a very acute angle with a very short polyp stalk. Anthocodial armature in eight very close and acute double rows. There are eight sclerites in each of the outer rows, three to seven on the four lateral rows, and only one or two on the inner double rows. Sclerites not uniform in size. Some are as large as 0.7 mm long and 0.056 mm wide. No crown sclerites visible on outer side of polyp head, but two to three rows of small crown sclerites are oftentimes seen on the inner side. All polyp sclerites provided with fine-pointed warts and all are light pink. Supporting bundle composed of six to eight spindles, the largest of which may be 3.5 mm long and 0.24 mm wide, extending only for a very short distance beyond polyp head. All sclerites of supporting bundle ivory white, with fine warts. On cortex of upper stem and branches are slender spindles arranged more or less irregularly. The largest are about 2.4 mm long and 0.13 mm wide, the smallest 0.56 mm long and 0.04 mm wide, all provided with small rounded warts. Mixed with the spindles and deeper in the cortex are more-numerous, small, slender sticks, 0.07 to 0.24 mm long, with very few warts.

Type: No. C–5001, University of the Philippines zoölogical collection, collected from Puerto Galera Bay, Mindoro. Polypary pinkish, stalk yellowish in alcohol.

DENDRONEPHTHYA MOSERI sp. nov. Plate 5, fig. 2.

Glomerate, with narrow, short, sterile basal stalk which gradually enlarges to form the main stalk and short fingerlike branches on which the groups of polyps are situated; polyp groups widely separate at stalk but much crowded together on branches; polyps at right angle with very short polyp stalk;

anthocodial sclerites small, in six double rows only, four to twelve in a row; crown sclerites absent; supporting bundle poorly developed; formula:

$$II = 4\text{–}12\ p + 0\ Cr + \text{weak S.B.}$$

Sterile stalk very short, hardly appreciable, which continues upward without any visible interruption to a gradually enlarging stem. This, after a short distance, gives rise to two or more main branches that in turn give off a number of short finger-like secondary branches at different levels. Lower portions of stalk entirely free from branches. Polyps in distinct groups of various numbers that are far apart on stem and main branches. On smaller branches, however, polyp groups are closely crowded, allowing no appreciable spaces between them. Polyp heads about 1 to 1.6 mm long and 0.8 mm wide, making an almost right angle with a short polyp stalk about 0.8 mm high. Anthocodial armature peculiar. There are, instead of the regular eight double rows, only six double rows of sclerites, the inner (ventral) double rows being absent. On the four dorsal double rows, there are eight to twelve small uniform sclerites in a row, while on the two ventrolateral there are only four to six in a row. Sclerites with fine warts, about 0.49 mm long, although the outermost of the four dorsal double rows are larger and slightly longer, about 0.84 mm long, and enlarged at the slightly protruding end. At times vestiges of the two ventral double rows are present in the form of few, tiny, irregularly disposed sclerites not exceeding 0.15 mm in length. Crown sclerites absent. Supporting bundle is of the ensheathing type, composed of six to eight spindles, one or two of which are about 1.8 mm long, extending only very slightly beyond polyp head. On cortex of branches and main stem are simple spindles, 1.2 to 2.2 mm long and 0.09 to 0.2 mm wide, with fine warts. They are more or less densely crowded together. Towards basal part of stem the spindles become shorter and develop higher warts. At extreme basal portion of stalk are irregular or branched spindles or clubs, ranging from 1.4 to 0.35 mm in length, with prominent projections. In cœnenchymal walls are few, tiny, weak-looking sticks, at most 0.28 mm long and 0.04 mm wide, with few fine warts.

Type: No. C–5002, University of the Philippines zoölogical collection, obtained from shallow water of Puerto Galera Bay, Mindoro. Four colonies; the largest with a total height of 70

mm and a polypary expense of 40 mm. Base white, stalk and branches light pinkish yellow; the polyps geranium pink due to color of anthocodial and supporting bundle sclerites.

This form definitely is to be reckoned under the *savignyi* group of Glomeratæ of Kükenthal. The habitus and spiculation, however, are different from any other glomerate *Dendronephthya* so far described.

DENDRONEPHTHYA FUSCA (Studer).

Spongodes fusca STUDER, Mitt. geogr. Ges. naturh. Mus. Lubeck (2) Heft 7 u. 8 (1894) 126, 127, pl. 4 fig. 3; pl. 6, fig. 5.

Glomerate, with slender and much-branched colony with polyps in separate bundles mostly on terminal twigs; polyps at right angle with short stalk; anthocodial armature in indistinct double rows, six in a row externally and three to four laterally; only small sticks present on inner side of polyp head; no crown sclerites present; supporting bundle medium sized; formula:

$$III = 3\text{–}6\ P + 0\ Cr + \text{medium S.B.}$$

Colony composed of a short trunk and a number of main stems, with brittle-looking cortex that divides to form side branches. From the side branches slender terminal twigs about 6 mm high arise. Polyps rounded, about 0.7 mm high and just as wide, making a right angle with polyp stalk about 0.7 mm high. Polyps in bundles not closely crowded on terminal twigs. On outer side of polyps are spindles about 0.34 mm long with strong warts arranged in irregular double rows, about six in a row. On the lateral sides the spindles are smaller, about 0.24 mm long, only three to four in a row. On inner side of polyp head are numerous small sclerites about 0.07 mm long with few warts. Similar sclerites are found in the tentacles. Supporting bundle composed of a number of warty, straight or slightly bent spindles that form a sheath on the polyp stalk. A pair of these extends out of the polyp head. A few of the supporting bundle sclerites may be as long as 2 mm and extend out for about 0.3 mm beyond the polyp head. On cortex of upper branches are numerous bent spindles extending in all directions, about 0.6 mm long and 0.08 mm wide, with many thorny warts. At lower cortex these spindles become more compact. In addition to them, short, clublike, and radiate bodies are present. In canal walls of branches are spindles 0.53 mm long with very long, oftentimes branched, warts. In stalk cœnenchyma are spindles 0.55 mm

long and 0.08 mm wide with widely separate, broad, and low warts. In addition few irregular radiate bodies may be present. Color light brown.

This description is based on a small specimen found in the Berlin Museum, which forms a part of the one described by Studer. Material obtained from Sulu Island. Type is at the Lubeck Museum.

DENDRONEPHTHYA GIGANTEA (Verrill). Plate 5, fig. 3.

Spongodes gigantea VERRILL, Bull. Mus. Comp. Zool. Cambridge (1864) 40.

Dendronephthya gigantea KÜKENTHAL, Zool. Jahrb. 21 (1905) 540, pl. 25, fig. 6.

Glomerate, with polyps forming large rounded masses that hide the underlying main stem and branches; lower branches slightly foliaceous; polyps more or less oval in shape, at obtuse angle with a short polyp stalk; anthocodial armature in eight double rows, about five or six in a row, all outermost being larger and projecting slightly only beyond polyp head; crown sclerites absent; supporting bundle exceptionally well developed; formula:

$$\text{III} = (1\ \text{P} + 4\text{–}5\ \text{p}) + 0\ \text{Cr} + \text{very strong S.B.}$$

Basal stalk very short, almost invisible. This at once gives off several stout main branches that, together with the main stem, are fully covered with a number of large rounded lobes formed by the polyps. Polyps more or less oval, 0.7 mm long and 0.9 mm wide, making a very obtuse angle with a short stalk less than 1 mm long. Anthocodial armature in the form of eight double rows, about five to six in a row. The sclerites are usually about 0.3 mm long, but the outermost, one or both in each double row, are longer and thicker and may extend prominently beyond polyp head. Crown sclerites absent. Supporting bundle exceedingly well developed, composed of four or more sclerites, one or two of which are as long as 4 mm and covered with prominent warts. They extend far out of the polyp head. On the cortex of upper stem and branches are large spindles, as long as 4 mm, covered with large, blunt, truncate, oftentimes compound warts. They lie transversely for the most part. On lower stem cortex are smaller, heavily warted spindles, 0.3 mm long on the average. In canal walls are few, large, thick, sparsely warted spindles about 0.8 mm long and

mixed with numerous smaller and thinner spindles about 0.3 mm long.

DENDRONEPHTHYA SPINIFERA (Holm). Plate 5, fig. 4.

Spongodes spinifera HOLM, Zool. Jahrb. Syst. 8 (1895) 37, pl. 2, fig. 20–22.

Glomerate, with short, stout, upper branches and expanded, foliaceous, lower branches; with numerous groups of polyps closely crowded, covering practically all the stem and branches; polyp stalk medium in length; anthocodial armature four to five in a row, with the outermost of the lateral rows more prominent and extending out; no crown sclerites; formula:

$$III = (1\ P + 3\text{–}4\ p) + 0\ Cr + \text{strong S.B.}$$

Colony bushy, stout and low. From a base two or more columnar, stout stems arise that give off only few, stout, rounded branches. Near the base a narrow, expanded, leaflike branch forms an almost complete collar around the stem. Polyps in small or large groups. The groups on main stem at times may be far apart but usually they are close together and leave no portion of the main stem and branches, especially the ends of branches, exposed. Polyps about 0.8 mm wide and about the same in length, standing in a very obtuse angle with a stalk from 0.7 to 1 mm in length. Anthocodial armature in eight double rows, four to five in a row. The outermost sclerites, especially of the lateral rows are larger, measuring as much as 0.8 mm in length, and extending far out of the polyp head. The other sclerites are smaller, on the average about 0.5 mm long. All anthocodial sclerites are yellowish, with widely separate, low, conical warts. No crown sclerites present. On tentacles are rather large sclerites, also yellowish, in double rows at middle. Supporting bundle composed of four or more spindles, large and pointed, one of which may be as long as 3 mm and extend well out of the polyp head. A few accessory yellowish sclerites are present on inner surface of polyp stalk. On cortex of branches and upper part of stem are large, heavy-looking, white or yellowish, straight or bent spindles reaching 5 mm long and 0.6 mm wide. On the basal cortex are also spindles for the most part, but these are shorter, at most 3 mm long and 0.3 mm wide, with low warts. A few may be forked at one end. Many are also much shorter and more slender. In the canal walls are also spindles, straight or bent, at most 2.3 mm long and 0.3 mm thick, with fine warts.

Reported from Viti Islands by Holm and later by Kükenthal and from Laccadive and Maldive Archipelago by Hickson. Philippine examples obtained from Puerto Galera Bay, Mindoro; one had a total height of 80 mm and a polypary expanse of 70 mm, and another slightly smaller, was 60 mm high and 65 mm wide. The colony as a whole is orange-yellow due to the color of the sclerites of the polyps and supporting bundle. Surface of the stem and branches light yellowish white.

DENDRONEPHTHYA ROEMERI Kükenthal. Plate 5, fig. 5.

D. roemeri KÜKENTHAL, Abhandlg. Senckenb. Naturforsch. Gesellschaft 33 (1911) 317.

Glomerate, with a tall columnar stem from which numerous, short, stumpy twigs of almost uniform length arise, giving the colony an almost uniform contour; polyps in small groups on short twigs arising from main stem, more compactly arranged at ends of larger branches and on top of main stem; polyp stalk short; anthocodial armature three to four in a row, with one outermost of each double row larger and extending out of polyp head; no crown sclerites present; formula:

$$\text{IV} = (1\ \text{P} + 2\text{–}3\ \text{p}) + 0\ \text{Cr} + \text{strong S.B.}$$

Presumably a young colony with a total height of 75 mm and a polypary expanse of 33 mm. Stalk tall and columnar, giving rise to very many, short, unbranched, stumpy twigs more or less uniform in length, giving the colony a uniform contour. Base separated from rest of colony by collarlike, expanded, leaflike branches. Polyps in groups at ends of short twigs all over main stem but crowded together in large bunches at end of longer branches and main stem. Polyps about 0.7 mm long and about the same width, standing at an obtuse angle with slender stalk about 0.9 mm high. Anthocodial armature in eight double rows, three to four in a row. Of these the outermost of the lateral rows are very much larger, as long as 0.84 mm, and they extend well out of the polyp head. The other sclerites are smaller, about 0.42 mm long. No crown sclerites present. Supporting-bundle sclerites well developed, one of which may be as long as 3 mm, extending far out of the polyp head, giving the colony a decidedly spiny appearance. In cortex of upper stem and branches are numerous whitish spindles, 3 to 4 mm long, mostly arranged transversely. On basal cortex the spindles are shorter, at most 1.4 mm long and 0.25 mm wide. Majority of basal cortical sclerites are irregular, branched or star-shaped bodies with fewer

but larger warts. Cœnenchymal walls contain numerous, large spindles on the average 2 mm long, with wide, somewhat corrugated warts, in addition to few, very tiny, smooth, simple or irregular sticks.

Two full-grown colonies reported from Aru and Kei Islands. Philippine material obtained from Puerto Galera Bay is ochraceous orange in color.

DENDRONEPHTHYA ACULATEA Kükenthal. Plate 5, fig. 6.

D. aculatea KÜKENTHAL, Zool. Jahrb Syst. 21 (1905) 559, pl. 27, fig. 10.

Glomerate, colony flattened in one plane, basal sterile stalk very short, dividing into a number of stout branches and twigs dichotomously; polyps in groups of 8 to 15 on main branches and twigs; polyps in obtuse or right angle with a medium-sized polyp stalk; point sclerites three to four, with one outermost larger and extending out; crown sclerites absent; supporting bundle well developed; formula:

$$IV = (1\ P + 2\text{–}3\ p) + 0\ Cr + \text{strong S.B.}$$

From a very short sterile stalk about 20 mm high a number of main branches are given off that divide dichotomously to give rise to terminal and side twigs. Lower branches expanded and leaflike. Polyps in distinct and separate groups of eight to fifteen on the main branches and twigs. Polyp heads about 0.75 mm high and 0.8 mm wide at obtuse or right angle with a stalk about 1.2 mm long. Anthocodial armature in eight double rows, three to four in a row. Lower sclerites in the double rows are at most 0.45 mm long, while one of the two outermost is much larger, as long as 0.9 mm, and extends prominently beyond polyp head. No crown sclerites present, although two or more of the anthocodial sclerites may be in very obtuse angle with one another and may appear as crown sclerites. Supporting bundle strongly developed, composed of four or more strong spindles, one of which is very large, as long as 4 mm, and may extend for over 1 mm beyond polyp head. One or two of the smaller supporting-bundle sclerites may also extend beyond polyp head. On the ventral side of polyp stalk are closely arranged accessory sclerites about 0.6 to 0.7 mm long. On cortex of branches and twigs are large spindles up to 4.2 mm long and 0.3 mm wide, with numerous closely set warts. Underneath these are much smaller and thinner spindles. In basal cortex are smaller spindles

about 1 mm long and 0.14 mm wide with rounded but stronger warts. In addition there are numerous, small clubs, irregular and star-shaped bodies of various dimensions. In the cœnenchyma are flat spindles with numerous, low, rounded warts.

Previously reported from Nagasaki Bay. The Philippine example (C–122) is from Puerto Galera Bay, Mindoro. This has a total height of 95 mm and a polypary expanse of 90 mm. In alcohol the stem and branches are white, while the polyps are oranged-red or light yellow due to the color of the sclerites.

DENDRONEPHTHYA HICKSONI Kükenthal. Plate 5, fig. 7.

D. hicksoni KÜKENTHAL, Zool. Jahrb. Syst. 21 (1905) 556, pl. 27, fig. 8.

Glomerate, polyps in rounded masses which almost completely hide the main stem and main branches; polyp stalk short; supporting bundle well developed; point sclerites three to four, none extending out of the polyp head; no crown sclerites; formula:

$$IV = 1\ P + 2\text{–}3\ p + 0\ Cr + \text{strong S.B.}$$

A sterile stalk that extends for about one-third of the entire height of the colony arises from the base. The main stem divides into two main branches which in turn give off numerous secondary branches. These then divide to form terminal twigs where most of the polyps are located. Polyps are also found on twigs that arise directly from the stem and main branches. In any case, the polyps form more or less spherical groups that partly or completely hide the twigs and branches. Polyps about 0.98 mm long and 0.84 mm wide, making an obtuse angle with a short stalk about 0.7 mm long. Anthocodial armature consists of eight double rows, about three to four in a row. The outermost in a double row is slightly larger and thicker than the rest, about 0.75 mm long and 0.07 mm wide, but does not project beyond polyp head. The other point sclerites on the average are 0.65 mm long and 0.04 mm wide. All anthocodial sclerites are with rather large, prominent, widely separate warts. No crown sclerites present. Supporting bundle consists of three to five spindles, one or two of which may be as long as 4 mm and extend prominently beyond polyp head. On cortex of branches are numerous small or large spindles with numerous rounded warts. The largest are about 2.2 mm long and 0.2 mm wide. Toward the base these spindles become shorter and thicker and more heavily warted, at most 0.8 mm long and 0.2

mm wide. In addition, numerous irregular or star-shaped bodies are found on the cortex. In canal walls are straight or bent spindles up to 2 mm long and 0.35 mm wide with scattered low warts.

Previously reported from Tonga Island. The Philippine example (C–2335) was obtained from a floating buoy at Legaspi Bay, Albay. This has a total height of 150 mm and a polypary expanse of 80 mm. Color yellowish.

DENDRONEPHTHYA SEMPERI (Studer).

Spongodes semperi STUDER, Ann. & Mag. Nat. Hist. VI 1 (1888) 69.

Glomerate, colony tall, with columnar stalk and conical polypary; branches more or less unbranched; polyps small, rounded, at right angle with short polyp stalk; anthocodial armature in eight double rows, about three in a row; crown sclerites present; supporting bundle well developed; formula:

$$V = 3\ P + 2\text{–}3\ Cr + \text{strong S.B.}$$

Colony composed of a strong, rigid, columnar stalk that takes up about three-fourths of the entire height of colony and arises from several short stolons. Polypary more or less conical and starts basally, collarlike, above the limit of the stalk. At its edge several polyps are found all around. Above, the polypary is composed of numerous conical, pointed branches, round in cross section, each about 70 mm long and 5 mm in diameter at its base. Polyps arranged in small groups or bundles that are more or less uniformly scattered on the branches. Polyp heads rounded, about 1 mm high and about the same in width, standing at a right angle with short thick stalk. Anthocodial armature in eight double rows, usually three in a row. These are spindles about 0.3 mm long with deep, prominent, longitudinal stripes and few warts. Below the point sclerites are two or three rows of crown sclerites. Supporting bundle composed of numerous, strongly developed spindles about 1.2 mm long with large warts spreading towards the base but converging apically. One or two are longer, extending slightly beyond polyp head. Between the polyps, in the cortex of the branches, are bent spindles up to 1.8 mm long. On stalk cortex are slender spindles up to 4 mm long and 0.48 mm thick, provided with thickly and regularly set small slender warts. They are more numerous on the basal than on the upper part of the stalk. In the cœnenchymal walls are few, widely separate, somewhat smaller, smooth spindles.

Colony about 77 mm high, with a stalk 54 mm high and 23 mm in diameter. Polypary expanse 28 mm. Color whitish gray. Collected by Semper from the Philippines and first described by Studer. Exact locality unknown. Type in München.

II. DIVARICATÆ

DENDRONEPHTHYA GRIFFINI sp. nov. Plate 5, fig. 8.

Divaricate, flattened in one plane, polypary without any regular outline; few polyps located in small groups at ends of terminal twigs, polyps mostly found singly arising directly from surface of main branches and twigs; polyp stalk very short; anthocodial armature in eight double rows, about eight in a row, the outermost being larger and extending out of polyp head; no crown sclerites; formula:

$$\text{III} = (1\ \text{P} + 7\ \text{p}) + 0\ \text{Cr} + \text{strong S.B.}$$

A small decidedly flattened colony with a tall but stout and slightly flattened stalk. At about one-third of the entire height of the colony are two small leaflike branches, widely separated, not forming a complete crown around the stem. Above this the stem soon divides into three main branches, two lateral and one median, all flattened in one plane. At their ends they give off few terminal branches, mostly also in the direction of the flattened plane. Few polyps are in small groups at terminal twigs; majority single, arising directly from the stem and main branches. Polyps about 0.7 mm long and 0.6 mm wide, standing at an obtuse angle with a short stalk about 0.5 mm long. Anthocodial armature in eight double rows, about eight in a row, the outermost larger, extending out of the polyp head. One or two intermediate sclerites are visible between the double rows towards the outer end of the polyp head. The outermost sclerites, on the average, are 0.6 mm long, while the other anthocodial sclerites are about 0.3 mm long. All are deep reddish yellow with fine prominent warts. No definite crown sclerites present. Supporting bundle well developed, composed of three or more stout, strong, reddish spindles, one of which extends way beyond polyp head. On ventral side of polyp stalk are other accessory sclerites, spindles, also reddish yellow. In cortex of stalk and main branches are densely packed spindles of various dimensions, mostly lying tranversely. The largest are about 2.3 mm long and 0.21 mm wide with numerous small conical warts. The smallest are very slender spindles about 0.4 mm long and

0.03 mm wide, also with fine conical warts. At base are similar spindles, although here many of them are forked. A few basal cortical sclerites are much smaller and branched, with larger warts. All cortical sclerites are reddish with a slight tinge of yellow. No cœnenchymal sclerites found.

Type: No. C–197, University of the Philippine zoölogical collection; Puerto Galera Bay, Mindoro, 1912; collected by tangle in about 20 meters of water; L. E. Griffin collector. Total height 50 mm, with a polypary expanse of 35 mm. Whole colony reddish with a slight tinge of yellow. Tips of polyp heads whitish yellow due to color of tentacles.

This is more or less similar to *D. flammea* Sherriffs in branching and habitus, and it certainly belongs to the *cervicornis* group of Kükenthal. Here, however, numerous single polyps are found arising directly from the stalk and branches. The anthocodial armature approaches that of *D. microspiculata* in arrangement, although the sclerites here are larger and the habitus of the colony is very different.

DENDRONEPHTHYA MICROSPICULATA (Pütter). Plate 5, fig. 9.

Spongodes microspiculata PÜTTER, Zool. Jahrb. Syst. 13 (1900) 459, pl. 29, fig. 9; pl. 30, fig. 14.

Divaricate, with a slender stalk and with a firm, rounded or oval polypary with lower foliaceous branches; polyps in divergent groups, four to nine in a group, situated mostly on terminal twigs; polyps in obtuse to right angle with long polyp stalk; anthocodial sclerites in eight double rows, six to eight in a row, the outer larger and extending beyond polyp head; crown sclerites absent; supporting bundle well developed; formula:

$$\text{II} = (1\ \text{P} + 5\text{–}7\ \text{p}) + 0\ \text{Cr} + \text{strong S.B.}$$

Colony treelike, more or less rigid, with a long or short, but always slender, sterile stalk and a rounded or oval polypary. Lower branches directed ventrally and definitely foliaceous. Upper branches cylindrical and divided into a number of smaller side branches and terminal twigs on which the polyps are situated. Polyps in diverging groups of four to nine. Polyps on the average about 0.5 mm long and 0.6 mm wide, making an obtuse or right angle with a slender stalk about 1 mm long. Anthocodial armature in eight double rows of six to eight sclerites in a row. The outermost are large, about 0.5 mm long, and with a more heavily warted outer end that protrudes beyond

polyp head. The other sclerites are smaller, about 0.2 mm, weakly warted and they come closely together in acute angles. No crown sclerites present. Supporting bundle well developed, composed of several spindles about 2.5 mm long and thickly but finely warted, one or two of which extend for about 0.5 mm beyond polyp head. On cortex of upper stem and branches are bent spindles of various sizes, 0.1 to 4 mm long, with regular, slender, rounded, small warts. On basal cortex these spindles are shorter and thicker and provided with stronger, oftentimes branched, warts. They are on the average 1 mm long and 0.17 mm wide. In addition, there are present on basal cortex numerous smaller clublike or star-shaped sclerites. In cœnenchymal walls are strong spindles about 1.6 mm long and 0.32 mm thick, as well as three-rayed sclerites. In addition there are other smaller, irregular, thorny, flat sticks and stars about 0.1 mm long.

Philippine material consists of three small colonies, each with a total height of 35 mm and a polypary expanse of 35 mm, obtained from Puerto Galera Bay in water about 10 fathoms deep. They all agree in having reddish white stalk, deep red upper branches and supporting bundle sclerites, and white anthocodial spindles. This form has also been reported from Amboina.

DENDRONEPHTHYA DIVARICATA (Gray).

Spongodes divaricata GRAY, Proc. Zool. Soc. London (1862) 29.

Divaricate, polypary with a regular rounded boundary, the branches being not of uniform length, and not laterally flattened, but more or less rounded; polyps at obtuse to right angle with a long stalk; anthocodial sclerites in eight double rows, five in a row; crown sclerites absent; supporting bundle of the ensheathing type; formula:

$$IV = (1\ P + 4\ p) + 0\ Cr + \text{medium S.B.}$$

Colony with a tall, columnar stalk that arises from numerous thin stolons. Stalk gives off all around a number of branches the lower ones of which are foliaceous. The upper branches are slender and cylindrical, making almost a right angle with the stem, and giving off at their upper portions a number of diverging side branches on which the polyps are located. Polyps in diverging groups, about three to six in a group. Polyp heads about 0.5 mm long and 0.45 mm wide, making an obtuse to right

angle with a slender polyp stalk about 2 mm high. Anthocodial sclerites in eight double rows, about five in a row. The outermost sclerites are larger, about 0.32 mm long, and extend beyond polyp head. The others are smaller, about 0.18 mm long. All are thick, sparsely warted spindles. Supporting bundle medium in size with one, sometimes two, spindles, as large as 2.4 mm long and 0.1 mm thick, extending about 0.6 mm beyond polyp head. Supporting bundle spindles that are provided with weak but regularly arranged warts form a sheath around the base of polyp stalk. In cortex of branches and upper stem are spindles as long as 2 mm. Usually they are much smaller and have fine, irregularly arranged warts. In basal cortex are similar spindles, although here they are thicker and provided with densely arranged, large, stout, rounded warts. In addition, numerous small three- or four-rayed sclerites, on the average 0.2 mm long, also with stout rounded warts, are found in the basal cortex. In canal walls are stout spindles, 0.8 mm long and 0.14 mm wide, as well as clubs, and four- and three-rayed bodies. All these sclerites are provided with stout but low and rounded warts.

Color yellowish white. One example, in the München Museum, collected by Semper in the Philippines, has a total height of 40 mm and a stalk about 20 mm in height. The exact Philippine locality is not recorded.

DENDRONEPHTHYA RADIATA Kükenthal. Plate 5, fig. 10.

D. radiata KÜKENTHAL, Zool. Jahrb. Syst. 21 (1905) 584, pl. 28, fig. 18.

Divaricate, polypary without any regular contour and not flattened; polyps in small groups at ends of twigs and surface of main branches; polyp stalk short; anthocodial armature two to three in a row, one of the outermost much larger and extends out of the polyp head; below are one to two rows of crown sclerites; formula:

$$V = (1\ P + 2\ p) + 1\text{–}2\ Cr + \text{strong S.B.}$$

Colony with a short basal stalk separated from the rest of colony by expanded leaflike lower branches. Above this, the stem gives off several main cylindrical branches that in turn give off few short terminal twigs. Polyps in groups of five to twelve at ends of twigs and on surface of main branches. Polyps about 0.64 mm long and about the same in width, standing at an obtuse angle with a short stalk about 0.6 mm long.

Anthocodial armature in eight double rows, about two to three in a row on the lateral sides and only one pair on the ventral side. One of the outermost sclerites in a double row, especially that of the lateral sides, is much larger than the rest and extends out of the polyp head. This is about 0.5 to 0.6 mm long, slightly thicker and more warty on the outer end. The other point sclerites are smaller, at most 0.4 mm long, and slightly narrower. Below the anthocodial sclerites are one to two irregular rows of crown sclerites. Supporting bundle exceptionally well developed, composed of several sclerites, one or two of which are ivory white, very large, as long as 4 mm, and extend far out of the polyp head. On main branches and twigs are elongate, white spindles, as long as 3 mm, irregularly arranged and not crowded. On basal cortex are also slender spindles of various sizes with many minute conical warts. The longest are about 2.5 mm long mixed with many other smaller spindles and irregular radiate bodies with numerous warts. In the canal walls are few spindles as long as 1.3 mm, with scattered low warts.

Reported from Tonga Island by Kükenthal. Philippine specimens from Puerto Galera Bay have a total height of 50 mm and a polypary expanse of 50 mm. Polyps scarlet in life, stem whitish. Found in shallow water.

DENDRONEPHTHYA PÜTTERI Kükenthal. Plate 5, fig. 11.

Spongodes studeri MAY, Jena. Zeitschr. f. Naturw. 33 (1899) 171, pl. 4, fig. 36.

Dendronephthya pütteri KÜKENTHAL, Zool. Jahrb. Syst. 21 (1905) 625, pl. 29, fig. 30.

Divaricate, polypary with a more or less continuous contour but slightly flattened in one plane, twigs uniformly long, basal twigs expanded, leaflike; polyp stalk shorter than 2 mm, anthocodial armature one to two in a double row, one of which is long and extends far out of polyp head; crown sclerites well developed, under which are other converging sclerites; formula:

$$\text{VI} = 2\ \text{P} + 2\text{–}3\ \text{Cr} + \text{strong S.B.}$$

Colony long oval, slightly flattened in one plane. Sterile stalk rather short, separated from rest of colony by two broad, expanded, leaflike, lower branches that form an almost continuous ring around stem. Just above the ring, main stem gives off two side branches. It then continues upward and then divides into two main branches. Main stem as well as branches gives

off numerous short twigs on which the polyp groups are located. Polyps in divergent groups of five to twelve, giving an impression that the entire surface of colony is uniformly covered with polyps. Polyps about 0.5 to 0.7 mm long and 0.63 mm wide standing at an obtuse angle with a slender stalk about 1.5 mm high. Anthocodial armature consists of eight double rows of sclerites, one to two in a row, one of which is large and prominent, extending far out of the polyp head. Below anthocodial sclerites are two to three rows of crown sclerites arranged more or less transversely. Below these are still other converging sclerites without any definite arrangement. Long point sclerites about 0.47 mm long, while most of the crown sclerites are about 0.28 mm long. All polyp sclerites are wine red, and have fine warts. Supporting bundle composed of several long, warty spindles, one of which is extremely long, extending beyond polyp head. On ventral surface of polyp stalk are also numerous medium-sized spindles which, like the supporting bundle, are wine red. On cortex of twigs, branches, and upper stem there are numerous, closely crowded, white, slender spindles with fine warts. At basal cortex are spindles at most 0.9 mm long and 0.17 mm wide with regular fine warts. In stalk cœnenchyma are numerous, weak, smooth-looking, flat spindles, triradiates, or four-rayed bodies of small dimensions, none of which exceeds 0.5 mm in length. The majority are much smaller, about 0.15 mm long.

Base whitish brown or dirty gray, stem and terminal twigs white, polyps wine red. Philippine material (C–2007) was obtained from Legaspi Bay at a depth of 90 meters. One has a total height of 55 mm and a polypary expanse of 30 mm. The other is slightly smaller.

DENDRONEPHTHYA CERVICORNIS (Wright and Studer). Plate 2, fig. 3; Plate 5, fig. 12.

See Kükenthal, Jahrb. Syst. 21 (1905) 592, for complete synonymy; also, Sherriff, Proc. Zool. Soc. London (1922) 54.

Divaricate, polypary has no uniform contour, distinctly flattened in one plane; undermost branches expanded, leaflike; polyp stalk rather long, anthocodial armature only one or two pairs to a point, below which are crown sclerites in four to five rows irregularly arranged, supporting bundle strong; formula:

$$VI = 1\text{–}2\ P + 4\text{–}5\ Cr + \text{strong S.B.}$$

From a short base a rather tall, tapering stalk arises. Sterile base about one-fourth of entire height of colony separated from

polypary by two or more leaflike, expanded, ventrally directed branches forming a collar around stem. Above this, main stem gives off at different levels, mostly in one plane, branches of different lengths, making the polypary distinctly flattened. Branches give off terminal twigs at different levels. Polyps at ends of twigs in small groups, rather divergent. These have bodies about 0.7 mm high and 0.8 mm wide standing in obtuse angle with a long, slender stalk about 1 mm high. Anthocodial armature usually one pair, although at times another pair of very small sclerites are present at every point. The largest anthocodial sclerite of each point about 0.58 mm long and extends prominently beyond polyp head. Below point sclerites are four to five rows of crown sclerites 0.2 to 0.37 mm long, which may converge toward each other at a very obtuse angle or may lie almost horizontally. Supporting bundle composed of well-developed spindles one of which may be as long as 4 mm, extending prominently beyond polyp head. On inner surface of stalk are other spindles. All sclerites of polyp supporting bundle and polyp stalk reddish yellow.

In cortex of twigs and branches are long, slender, white spindles, not very densely crowded. The largest of these are about 4 mm long and 0.3 mm wide. In the cortex of the base are densely packed, stout spindles of various sizes, the largest of which are 2.2 mm long with numerous, low, corrugated warts, mixed with numerous smaller ones with less-prominent warts. Both kinds of sclerites may be forked or otherwise deformed. In the cœnenchyma similar but fewer sclerites are present.

Previously reported from Tahiti, Funafuti, Kei, New Britain, and Andaman Islands. One Philippine example (C–2004), from Taytay Bay, with a total height of 110 mm and a polypary expanse of 40 mm, has stalk, twigs, and branches white, and the polyp stalk and polyp heads reddish yellow. Another example (C–2314) is smaller, with a total height of 60 mm and a polypary expanse of 60 mm. Instead of having one main tapering stalk, three main branches arise just above the lower leaflike branches. The coloration is the same.

DENDRONEPHTHYA GRACILLAMA Kükenthal. Plate 5, fig. 13.

D. gracillama KÜKENTHAL, Zool. Jahrb. Syst. 21 (1905).

Divaricate, polypary flattened laterally, with an oval outline, lower branches leaflike, polyps in small divergent groups at ends of twigs, polyp stalk short, anthocodial armature in eight double

rows, with one pair of point sclerites, crown sclerites three to four, slightly converging toward anthocodial points; formula:

$$VI = 1\ P + 3\text{–}4\ Cr + \text{strong S.B.}$$

Colony with tall, columnar stalk more than one-half of entire polypary. Stalk separated from rest of polypary by two separate, basal, leaflike branches. Stalk divides above to form three main branches that in turn give rise to numerous small side branches. Polyps located in divergent groups at ends of twigs, in groups of four to ten. Entire polypary distinctly flattened with an oval outline. Polyps about 0.7 to 0.8 mm long and 0.9 mm wide at an obtuse angle, almost right, with a short stalk about 0.9 mm long. Anthocodial armature composed of eight double rows, usually only one pair in a double row, one of which is about 0.8 mm long and extends prominently beyond polyp head. Between the double rows are also a pair of very small sclerites lying in the direction of polyp head axis. Crown sclerites well developed, about three to four horizontal or slightly converging rows under each anthocodial point. Each crown sclerite about 0.3 mm long. Supporting bundle also well developed, consisting of two or more small and one or two very large ones, the largest being as long as 3 mm and extending more than 1 mm beyond polyp head. On ventral side of polyp stalk are accessory orange-yellow spindles, more or less arranged in chevrons. In cortex of upper stem and branches are numerous spindles up to 1.8 mm long and 0.16 mm wide. At lower portions of stalk are small star-shaped bodies about 0.13 mm long, and small spindles about 0.5 mm long. Canal walls contain weak sticks about 0.1 mm long which at lower portions of the stem become mixed with small star-shaped bodies.

Philippine material was obtained attached to a cable in Legaspi Bay in about 90 meters of water. The total height is 70 mm and the polypary expanse is 45 mm. Color of stalk whitish, polyps orange-yellow.

This form was first called *D. flabelligera* Studer by Holm, but later renamed *D. gracillama* by Kükenthal as he found several differences between the present form and *D. flabelligera* of Studer.

DENDRONEPHTHYA FLAMMEA Sherriffs. Plate 5, fig. 14.

D. flammea SHERRIFFS, Proc. Zool. Soc. London (1922) 57.

Divaricate, polypary decidedly flattened with irregular outline, lower branches leaflike, not forming a complete collar around

stem; most branches given off in one plane; twigs short and not numerous; polyps in groups of five to seven, although a few may be found singly on branches; anthocodial armature one to two in a row, the two outer extending far out of the polyp head; crown sclerites in three horizontal rows; formula:

$$VI = 1\ P + 3\ Cr + \text{strong S.B.}$$

Sterile stalk short and laterally flattened. This gives off two main branches with two, small, leaflike, expanded branches just at the point where the larger branches are given off. Lower expanded branches do not form complete collars around stem. Main branches give off several short, rather stout, secondary branches at different levels, mostly in one plane, making the colony more or less distinctly flattened. Terminal twigs that are also short and stumpy give rise to the polyp groups. A few polyps may be found singly on branches. Polyps in well scattered groups of five to seven, making the branches and twigs distinctly visible. Polyp heads relatively small, about 0.7 mm wide and 0.5 mm long, standing in obtuse angle with a short, stout polyp stalk, at most 0.8 mm long. Anthocodial armature consists of eight double rows of one to two in a row. Outermost sclerites much larger, one of which is as long as 0.6 mm, extending far out of polyp head. Two intermediate sclerites between two points are much smaller. Below anthocodial armature are crown sclerites arranged more or less in three horizontal rows, each sclerite being 0.3 mm long. All anthocodial and crown sclerites are white spindles with fine warts. Supporting bundle composed of three or more slender spindles, one of which extends for about 0.5 mm beyond polyp head. On ventral side of polyp stalk are numerous spindles of various sizes. Supporting bundle and stalk sclerites pink and with fine warts. In twigs and branches are red spindles of various dimensions, the largest of which is about 2.5 mm long and 0.3 mm wide. These tend to stand out from the general cortex. All sclerites mentioned by Sherriffs (1922) in his type are present in the cortex of this example. Unlike the type, however, few rather large simple spindles, triradiates, and forked spindles with prominent warts were found in the canal walls. Philippine material (C–2320) from Albay Bay, Luzon, has a total height of 65 mm and a total polypary expanse of 40 mm. Stem, branches, twigs, polyp stalk, and supporting bundle pink; polyp heads white due to color of the spicules.

III. UMBELLATÆ

DENDRONEPHTHYA REPENS Kükenthal. Plate 5, fig. 15.

D. repens KÜKENTHAL, Zool. Jahrb. Syst. 21 (1905) 678, pl. 31, fig. 48.

Umbellate, the umbels not combining to form hemispherical masses; branches of approximately the same length, thus forming a continuous surface; groups of polyps situated on ends of branches; polyp stalk slender, polyp body slender, with no crown sclerites; with many small point spicules, none extending out; formula:

$$I = \text{many p} + 0\ \text{Cr} + \text{strong S.B.}$$

Colony with very tall, columnar stalk that rises undivided for about half of the entire height of colony. Separating the sterile stalk from the polypary is a ring of expanded, ventrally directed, curved, lower branches that form an almost complete collar around the stalk. Beyond this the stem divides dichotomously, ending on small terminal twigs arranged in the form of umbels on which the polyps are located. Few umbels may also arise from main branches. Polypary may be rounded, oval, or irregular. Polyps in groups of twelve to twenty. Polyps when fully expanded are slender, about 0.7 to 0.77 mm long (excluding tentacles), and 0.56 mm wide, making a right or obtuse angle with a slender polyp stalk about 1 mm long or longer. Anthocodial sclerites are small, densely packed sticks in eight double rows, very numerous in a row, none of which extend out of the polyp. Largest polyp sclerites about 0.11 mm long, although many are much smaller. In tentacles are numerous tiny sclerites arranged in two transverse rows. All polyp sclerites white. On inner surface of polyp stalk are also numerous small sclerites, but these are purplish red. Supporting bundle composed of two, sometimes more, reddish sclerites which project beyond polyp head. Basal cortical sclerites are stout short spindles, on the average 0.4 mm long and 0.12 mm wide with low wide warts. These spindles are often forked or four-rayed. In addition there are very numerous, small, radiate or irregular bodies with low, wide or pointed warts or projections of various dimensions and shapes. In cœnenchyma of base and stalk are very large stout spindles of various dimensions with conical warts. Many of these are also forked and may be reddish.

Main stalk purplish red, main branches yellowish white, terminal twigs deep purplish red; polyps white. Color mostly due to color of sclerites.

Kükenthal's (1905) type was only a small portion of a colony from the Philippines, and his description of the habitus of the colony is not typical. In the Berlin Museum there are fifty-six examples of this species collected in various parts of the Philippines by S. F. Light, L. E. Griffin, and A. L. Day in 1915. The smallest colony is 35 mm high with a polypary expanse of 18 mm. The largest has a total height of about 100 mm and a polypary expanse of 60 mm. All of them show the coloration as described above.

DENDRONEPHTHYA MANYANENSIS sp. nov. Plate 5, fig. 16.

Umbellate, with a long, tall, sterile stalk and spreading polypary; polyps in form of umbels grouped together to form hemispherical clusters only at ends of terminal twigs; polyps elongate at obtuse angle with a medium length stalk; anthocodial armature in eight double rows, four to twelve small sclerites in a row; crown sclerites absent; supporting bundle poorly developed; formula:

$$II = 4\text{–}12\ p + 0\ Cr + \text{weak S.B.}$$

Sterile stalk tall, columnar, and slender, rising to a height of about 30 mm before branching. At its upper end the stalk gives off three main branches that at once divide to form the secondary branches. These then, by several branchings, finally end in terminal twigs where the polyps are located. Terminal twigs form umbellike groups and several umbels are grouped to form clusters, all umbels being formed only by the terminal twigs. Polyp heads are elongate and more or less tubular, about 0.9 mm long and 0.7 mm wide, making a very obtuse angle with a stalk about 0.8 mm high. In many cases it is rather hard to see the exact line of division between the stalk and the head. Anthocodial armature in eight very distinct double rows of small spindles of almost uniform size, none extending out. On the four dorsal double rows there are ten to twelve in a row; on the two ventrolateral six to eight in a row, and on the two ventral double rows four to six in a row. Point sclerites on the average are 0.23 mm long with fine-pointed prominent warts. Crown sclerites absent. Supporting bundle poorly developed

and of the ensheathing type. This is composed of six or more spindles which adhere closely to the dorsal side of polyp stalk, none of them projecting beyond the polyp head. The largest supporting bundle sclerite is usually less than 1 mm long. On cortex of twigs, branches, and upper stalk are very slender spindles at most 0.56 mm long and 0.042 mm wide with a few conical prominent warts. In addition are tiny, warty sticks or irregular bodies of smaller dimensions. On basal cortex are only tiny, irregular star-shaped or branched bodies, on the average 0.14 mm in diameter, which are densely packed together. No spindles present. No sclerites could be seen in the cœnenchymal walls of stalk.

Type: No. C–140, University of the Philippines zoölogical collection, from Puerto Galera Bay, Mindoro, two specimens. One specimen has a total height of 50 mm and a polypary expanse of 40 mm. The other has a total height of 40 mm and a polypary expanse of 30 mm. In alcohol, stalk, branches, and twigs are fleshy, the polyps yellowish and the sclerites white.

This form belongs to the *collaris* group of Kükenthal and is closest to *D. umbellifera* in habitus. None of the other six species belonging to this group agrees with the present species in spiculation and anthocodial armature.

DENDRONEPHTHYA BREVIRAMA (Burchardt). Plate 5, fig. 18.

Spongodes brevirama BURCHARDT, Alcyonaceen von Thursday Island und von Amboina, Semon Forschungsreisen 5 (1898) 438–439.

Umbellate, umbels not forming spherical groups; branches seemingly of the same length, giving the colony a slight flattened, long-oval contour; umbels with a flat or slightly convex surface; polyp stalk short, about 1 mm or shorter; anthocodial armature six to eight in a row, the outermost not extending out; crown sclerites absent; formula:

$$II = 6\text{–}8\ p + 0\ Cr + \text{strong S.B.}$$

A very short base gives rise to a vertical, slightly flattened, flaccid stalk, which in turn gives rise to several short branches at different levels. Branches divide to form terminal twigs arranged umbellike. Lower branches weak and slightly leaflike, not forming a complete collar around stem. Polyps in seemingly crowded groups of five to twenty on surface of colony, at ends of umbels. Polyps about 0.7 mm long and 0.63 mm wide, making an obtuse, or nearly right, angle with a stalk about 1 mm long or shorter. Anthocodial armature consists of eight close double

rows of white spindles, about six to eight in a row, the outermost not much larger than the rest and extending only a very short distance out of the polyp head, or not at all. Anthocodial sclerites on the average about 0.3 mm long, although one or two of the outermost may be as long as 0.42 mm. In tentacles are double rows of tiny reddish sclerites. Supporting bundle composed of four or more slender red spindles, one of which may be as long as 2.5 mm and extends out of polyp head. On ventral side of polyp stalk are few accessory spindles, at most 0.2 mm long. At ends of twigs are numerous spindles of various sizes, mostly arranged along their long axes. On stem and main branches are slender spindles, at most 2 mm long and 0.15 mm wide, with prominent warts. In basal cortex are stouter spindles about 0.5 mm long in addition to numerous three-rayed or four-rayed sclerites with prominent warts.

A Philippine example (C–156) was collected by Light by means of dredging in the northwest channel leading to Puerto Galera Bay, Mindoro, in 13 to 25 meters of water with sandy bottom. The specimen has a total height of 56 mm and a polypary expanse of 40 mm. Stalk and main branches whitish; terminal twigs red, and polyps white.

DENDRONEPHTHYA FLORIDA (Esper). Plate 2, fig. 2; Plate 5, fig. 17.

See Kükenthal, Zool. Jahrb. Syst. 21 (1905) 651, for complete synonymy.

Umbellate, umbels do not form definite hemispherical groups; branches nearly of the same length, giving the polypary a uniform contour that may be slightly flattened in one plane or not; umbels with convex outer surface; polyp stalk rather long; polyp armature in double rows, five to seven in a row, none extending out of polyp head; no crown sclerites; formula:

$$\text{III} = 5\text{–}7\ \text{p} + 0\ \text{Cr} + \text{strong S.B.}$$

Stalk columnar, high, about half of the entire height of colony. This is separated from rest of colony by five leaflike expanded branches that closely form a collar around the stem. Above this the main stem gives off several, small, short twigs and then divide into two or more main branches. These in turn subdivide several times and finally give rise to the terminal umbellike twigs on which the polyp groups are located. The branches may or may not all arise in one plane. Polyps mostly in groups on surface of colony. Polyps about 0.42 mm long and 0.49 mm wide, making a very obtuse angle with a stalk usually about 1 mm

long. In certain cases the polyps may stand almost upright so that no sharp boundary between stalk and polyp head can be seen. Polyp armature in eight double rows, five to seven in a row, wine red, usually about 0.15 mm long, although a few may be as much as 0.3 mm long. None of the uppermost sclerites extends beyond polyp head. Tentacles with numerous rounded pinnules with very few or no sclerites. No crown sclerites are visible, inner surface of polyp stalk and basal portions of polyp bodies free from sclerites. Supporting bundle composed of three or more large reddish spindles, one or two of which extend beyond polyp head. On basal cortex are stout spindles with pointed ends. They are 0.8 mm long and 0.154 mm wide with low, simple, or slightly branched warts. Many of cortical sclerites are also three-rayed, four-rayed, or otherwise irregular. In addition there are very numerous, small, irregular bodies with blunt or pointed projections of various shapes and dimensions. In cœnenchyma are very large, stout, simple or forked spindles with low, rounded or slightly divided, warts.

Base of main stem purplish red, upper portion of stem, branches, and twigs of umbels whitish; polyps yellowish white, but anthocodial armature and supporting bundle reddish purple.

Philippine material (C–11 and 112) includes three colonies of unknown locality. The largest has a total height of 90 mm and a polypary expanse of about 60 mm. The coloration of the three colonies agrees very closely with Esper's original illustration of the species, although it differs slightly from those described by Gray (1862) and Kükenthal (1905).

DENDRONEPHTHYA ANGUINA (Wright and Studer).

Spongodes anguina WRIGHT and STUDER, Challenger Report 31 (1889) 205–207.

Umbellate, colony with a tall columnar stalk, all branches of the same length, polypary rounded, umbels forming small rounded groups, polyps small, at right angle with a strong stalk, anthocodial armature in eight double rows, about six in a row, outermost slightly larger and extending a little beyond polyp head; crown sclerites absent; supporting bundle well developed; formula:

$$\text{III} = (1\ \text{P} + 5\text{–}6\ \text{p}) + 0\ \text{Cr} + \text{strong S.B.}$$

Colony with a long, cylindrical, soft stalk that extends for about eight-ninths of the entire height of colony. Polypary composed

of a number of lower, strong, horizontal branches arising at the same level. Above these is another set of branches, directed more upwards, forming a whorl around the tip of stem. Branches all of the same length, giving the polypary a rounded contour. At their ends are the twigs, which give rise to the umbels composed of five to ten polyps. Umbels come together in more or less rounded groups. Polyps are more or less flat, standing at a right angle with their strong stalk. Anthocodial armature in eight double rows of about six fine sclerites in a row, the outermost larger and slightly projecting beyond polyp head. These sclerites are as much as 0.5 mm in length. Tentacles with two rows of converging sclerites up to 0.12 mm long. Supporting bundle composed of numerous spindles up to 1 mm long, a few of which extend slightly beyond polyp head. In cortex of branchlets are few longitudinal slender spindles up to 1.5 mm long with fine warts. The larger branches as well as the stalk have a soft outer surface provided with few irregular bodies. In them as well as in the canal walls, widely separate, star-shaped bodies about 0.12 mm long are also found.

General color whitish yellow, polyps red, tentacles whitish yellow. The largest specimen collected by the Challenger Expedition is 180 mm high with a stalk 150 mm long and 10 mm wide, and a polypary expanse of 43 mm. The species is not represented in the present collection.

DENDRONEPHTHYA MALAYA sp. nov. Plate 5, fig. 19.

Divaricate, flattened, with an oval periphery; all secondary branches almost of the same length; lower branches foliaceous; polyps small, in diverging groups at ends of twigs and at right angle with slender stalk; point sclerites small, four to five in a row with the outermost only slightly larger and at times extending beyond polyp head; crown sclerites absent; supporting bundle well developed; formula:

$$IV = 4\text{–}5\ p + 0\ Cr + \text{strong S.B.}$$

Colony treelike, with a cylindrical, columnar, sterile stalk and flattened polypary with an oval periphery. Stalk arises from numerous rootlike stolons and grows vertically for some distance before branching. Lower branches foliaceous and ventrally directed. Above these, stem divides into three main branches. These, in turn, give off numerous side branches and finally to the terminal twigs. Polyps in groups of four to ten, the polyps

in a group distinctly diverging from each other. Polyps delicate-looking, about 0.77 mm long and 0.65 mm wide, making almost a right angle with a slender stalk 1 to 1.4 mm long. Anthocodial sclerites in eight double rows of acutely converging sclerites, four to five in a row. These sclerites are usually 0.3 to 0.4 mm long and 0.02 mm wide, with fine warts. Outermost may be slightly longer and may project slightly beyond polyp head. Crown sclerites absent, although in distorted polyps the lower point sclerites may be abnormally placed so as to appear like crown sclerites. Supporting bundle consists of about six very long slender spindles, one or two of which may be as long as 3 mm, extending beyond polyp head for about 1 mm. On cortex of upper stem and branches are simple spindles, at most 2.4 mm long and 0.14 mm wide, with fine low warts. On basal cortex are spindles, at most 1 mm long and 0.12 mm wide, with prominent, large, truncate warts, mixed with spinous clubs and irregularly branched bodies, on the average 0.35 mm long and 0.14 mm wide, also with prominent warts. In cœnenchymal walls are few spindles, about 1.3 mm long and 0.15 mm wide, with few but prominent warts.

The type (C–139), from Puerto Galera Bay, Mindoro, has a total height of 60 mm and a polypary expanse of 45 mm. Stem and branches white, polyps light fleshy yellow, all sclerites white.

This form is nearest *D. depressa* in anthocodial armature. It belongs to the *rigida* group of Kükenthal, in the Divaricatæ, but differs in many respects from the nine species listed under this group.

DENDRONEPHTHYA RUBRA (May). Plate 5, fig. 20.

Spongodes rubra MAY, Jena. Zeitschr. f. Naturw. 33 (1899) 169, pl. 4, fig. 32.

Colony with a short stalk and a horizontally flattened polypary, branches dividing dichotomously, all polyps in groups only at periphery; polyps at a right or acute angle with a medium long stalk, anthocodial sclerites in eight double rows, usually four to five in a row, one of the outermost larger and extending beyond polyp head; two pairs of small sclerites between the outer portions of the double rows; no crown sclerites present; supporting bundle strongly developed; formula:

$$IV = (1\ P + 3\text{–}4\ p) + 0\ Cr + \text{strong S.B.}$$

Colony with a short stalk that gives off a number of horizontal main branches in such a way that the polypary appears horizon-

tally flat. These main branches are cylindrical and divide dichotomously to form the side branches and finally the terminal branchlets where the polyp groups are exclusively located. Polyps in groups of five to ten, the groups not coming together but more or less scattered uniformly on the outer surface of the polypary. Polyps more or less rounded, on the average 0.65 mm high and 0.75 mm wide, making a right or acute angle with a stalk about 1 mm high. In small polyps anthocodial armature consists of eight double rows, mostly weakly warted wide spindles five to eight in a row. Usually the sclerites are about 0.25 mm long and 0.045 mm wide. In large mature polyps there are only four to five in a row; one of the two outermost in a row is much larger, being about 0.5 mm long and extending out prominently. Between the double rows, towards the tentacles, are one or two pairs of much smaller sclerites. Crown sclerites absent. Supporting bundle well developed, one of the spindles attaining a length of 3.5 mm and extending out of the polyp head for over 1 mm. Supporting-bundle spindles with very fine warts. On the cortex of upper branchlets, slightly bent large spindles up to 4 mm long with larger warts are found mixed with numerous smaller ones. In the cortex of the main stem similar, although slightly thicker, spindles provided with regularly set, long, slender warts with rounded tips are present. Endodermal canal walls provided with large and small, almost smooth, greatly bent spindles up to 1.8 mm long.

Colony dark red, polyps white.

The example originally described by May was obtained from the Philippines, but the exact locality is not known. It has a total height of 40 mm, a stalk about 17 mm high, and a polypary expanse of 43 mm.

DENDRONEPHTHYA UMBELLATA (Wright and Studer).

Spongodes umbellata WRIGHT and STUDER, Challenger Report 31 (1889) 203, 204, pl. 36E, figs. 3*a*, 3*b*.

Umbellate, polypary flattened, mostly developed on one side with a more or less circular or oval outline; polyps mostly at terminal twigs in form of small umbels; polyps at obtuse angle with a short stalk; anthocodial armature in eight double rows, three to four in a row, one of the outermost extending prominently; no crown sclerites present; supporting bundle of medium size; formula:

$$\text{IV} = 1\,\text{P} + 2\text{–}3\,\text{p} + 0\,\text{Cr} + \text{medium S.B.}$$

Colony flaccid, treelike, and mostly developed only in one plane. Stalk short and provided with prominent longitudinal folds. Polypary more or less circular in general outline. On one side there are hardly any polyps present, while on the other the polyps are arranged in small umbels. The branching is characteristic in that the main and side branches are fully free from polyps and thus fully visible. The side branches at their ends give rise to several short terminal branchlets, all of the same length, from which the polyps stand out almost all of the same height. Lower branches closely crowded, shorter, somewhat flattened foliaceous, and surrounding the stem like a collar. Polyps cuplike, about 0.55 mm high and just as broad, standing at a very obtuse angle with a stalk about 1 mm long. Anthocodial armature in eight double rows, three to four in a row, one of the outermost in each double row much larger, about 0.52 mm long, strongly warted, and extending out of the polyp head. The other sclerites are smaller, about 0.25 mm long, and weakly warted. No crown sclerites. Supporting bundle of medium size, composed of several straight, weakly warted spindles about 2 mm long, one of which usually extends a little beyond polyp head. In the cortex of upper branches are slender, finely warted, slightly bent spindles about 2 mm long. Basal cortex in addition to few spindles, clubs, and three-rayed sclerites about 0.6 mm long, has numerous small star-shaped bodies about 0.13 mm in diameter. In the canal walls are similar, but smaller, flatter and smoother, star-shaped sclerites.

Colony white, polyps and sclerites of terminal branchlets dark red. Philippine material upon which the original description of Wright and Studer was based is an incomplete specimen collected by the Challenger Expedition from water 8 to 11 fathoms deep, at Zamboanga, Mindanao. *Spongodes bicolor*, described by Wright and Studer and by Burchardt (1898), is evidently this species.

Genus STEREONEPHTHYA Kükenthal

Stereonephthya KÜKENTHAL, Zool. Jahrb. Syst. 21 (1905) 694.
Stereonephthya THOMSON and MACKINNON, Trans. Linn. Soc. London 13 (1909) 185.

The genus *Stereonephthya* is a later name for Gray's (1869) subgenus *Spoggodia*. Gray's diagnosis of this is as follows: "The polyps isolated in the prominent isolated spiculose subcylindrical cells, scattered on the sides, or forming tips of the

branchlets." Also Klunzinger (1877) recognized this subgenus by stating that "Die Kopfchen einzeln, zerstreut, nicht in deutliche Läppchen gruppiert." Wright and Studer (1889) included this subgenus in their "divaricatæ" group under the genus *Spongodes*. Holm (1895) used *Spongodes* as the generic name and divided it into four subgenera; namely, *Spoggodia, Nephthya, Panope,* and *Spongodes*. According to him the subgenus *Spongodes* has the polyps distinctly arranged in bundles, while in the other three the polyps are not so arranged. Furthermore, *Spoggodia* has fingerlike cylindrical branches and differs from *Nephthya* and *Panope,* which have the branches divided into lobes. Kükenthal (1898) also has pointed out that *Spoggodia* is recognizable through its polyps which are scattered singly and not united in lobes, on long cylindrical branches. In a later work, Holm (1904) suggested that in as much as *Nephthea* was elevated to the rank of genus, *Spoggodia* should also be so treated. This was done by Kükenthal (1905), who at the same time changed the name *Spoggodia* to *Stereonephthya. Spoggodia* could not be retained as from the time of Dana (1864) it has been used synonymously with *Spongodes*. The name *Spongodes* also could not be used, as its type, *S. celosia,* is a species of *Nephthea*. Thus, when Kükenthal changed the name *Spongodes* to *Dendronephthya,* he also had to change the name *Spoggodia*. Contemporary workers assign the following diagnosis to *Stereonephthya:* Rigid Nephthyidæ whose polyps are provided with a supporting bundle and are neither in lobes nor in bundles but arranged singly or in small groups on a stem that may or may not give rise to main branches.

There are at least twenty-two species of *Stereonephthya* described. Only two of these are found in the Philippines. In this paper I describe one species that is evidently new.

STEREONEPHTHYA CRYSTALLINA Kükenthal.

S. crystallina KÜKENTHAL, Zool. Jahrb. 21 (1905) 703, pl. 32, fig. 56.

Colony very brittle, composed of a low membranous base from which a few, thick, rapidly tapering stems arise. Side branches most numerous around the lower portion of the stem. Polyps are arranged singly, far apart at lower parts of branches but closer together towards their ends. Polyp bodies about 0.7 mm long and 0.6 mm wide, making an acute to right angle with a stalk 1.3 mm high. Anthocodial sclerites in eight double rows,

five to seven spindles in a row. Those on the outer rows are spindles 0.2 to 0.3 mm long, while those on the inner rows are slightly smaller. Two or three rows of few crown sclerites are present. Supporting bundle with one or two slender elongate spindles up to 2 mm long, which may extend beyond polyp head for 0.5 mm. Small spindles are present on the ventral side of polyp stalk. On cortex of branches are weak, slightly bent, slender spindles up to 2 mm long with few strong warts. On the lower cortex are shorter but thicker spindles as long as 0.7 mm, with high elongate warts, as well as clubs and radiate bodies. Numerous spindles with few and low warts are present in cœnenchymal wall.

Colony light whitish yellow, branches on upper part with bright pink tinge. Total height of colony 37 mm, polypary expanse 35 mm.

This description is based on a Philippine specimen in the Vienna Museum of which the exact locality and collector are unknown.

STEREONEPHTHYA BELLISSIMA Thomson and Dean.

S. bellissima THOMSON and DEAN, Siboga-Expedition 13d (1931) 143, pl. 7, figs. 2, 3, 4, and 5.

From a very weak, thin-walled, very short, sterile base, an upright stem arises which gives off a number of side branches. The whole colony appears flaccid, not rigid, especially near the base, where there is a tendency to collapse. Polyps arise either singly or in small groups, but never in bundles. They are present all over the polypary, although they are most numerous at the end branches, where they are more closely arranged together. Polyps on the average are 1.3 mm long and 0.7 mm wide, making a very acute angle with a stalk, usually short, not more than 1 mm long. Anthocodial armature only in five double rows, the three inner double rows being absent. On the three outer double rows there are six to eight spindles in a row, while on the laterals there are only three to four in a row. The sclerites are elongate, slender spindles about 0.35 mm long with few prominent warts. No crown sclerites present. Supporting bundle is of the ensheathing type, usually two spindles of which are larger, about 2.4 mm long, protruding beyond polyp head for about 0.7 mm. On the cortex of branches and stalk are few slender spindles, at most 1.2 mm long and 0.084 mm wide, with few conical warts. Under these are numerous small, weak,

slender sticks about 0.12 mm long, densely packed together. In the cœnenchyma are very few pointed spindles, usually 0.42 mm long and 0.07 mm wide, with few weak warts.

In the collection there are four colonies which agree very closely with the description of *S. bellissima* of Thomson and Dean. In our specimens, however, spindles although very few are found in the cœnenchyma. The sclerites of stalk and branches are white, supporting bundle deep red, while the anthocodial sclerites are light pink. The largest colony has a total height of 90 mm and a polypary expanse of 60 mm.

Locality: Puerto Galera Bay, Mindoro.

STEREONEPHTHYA CAMPANULATA sp. nov.

Colony with a rather weak encrusting base from which two or more stems arise. These at once divide irregularly to form numerous branches from which short side branches arise. Polyps usually arise singly from the stem and main branches, but at the ends of side branches they are more numerous and more closely set, although they cannot be said to form bundles. A polyp is about 1.5 mm long and 0.85 mm wide, hanging like a bell at a very acute angle from a short stalk about 0.7 mm high. Anthocodial armature in only five double rows, the three inner being absent. On the outer double rows there are usually six sclerites in a row, while on the lateral there are three to five in a row. The outer sclerites are longer, about 0.65 mm long, with a swollen, glistening, white portion just behind the pointed tip which protrudes slightly beyond polyp head. The outer sclerites are also spindles, slightly shorter, about 0.55 mm long. All anthocodial sclerites are pointed and provided with numerous conical warts. On tentacles are numerous fine sclerites. Supporting bundle is of the ensheathing type, composed of eight to ten reddish spindles, usually about 1 to 1.8 mm long, two of which tend to extend out of the polyp head only for a short distance. On the cortex branches are three kinds of sclerites as follows: (*a*) A few, large, stout, reddish sclerites about 2 mm long and 0.14 mm wide; (*b*) numerous, densely packed, smaller spindles; and (*c*) many, tiny, elongate sticks, all with rounded warts. On the basal cortex are stouter spindles, usually about 0.9 mm long and 0.14 mm wide, with rounded warts, and small clubs or branched sclerites or irregular bodies of various dimensions. Canal wall very thin with very few widely scattered spindles at most 0.56 mm long and 0.05 mm wide.

Colony purplish red due to color of cortical sclerites and supporting bundles. Polyps whitish.

Type: No. C–2534, University of the Philippines zoölogical collection, from Puerto Galera Bay, Mindoro. The largest of the three colonies has a total height of 85 mm and a polypary expanse of 80 mm.

This differs from *S. bellissima,* to which it is closest, in having (*a*) larger anthocodial sclerites, the outermost of which are very prominent and extend beyond polyp head; (*b*) shorter and narrower branches and not very closely crowded, but larger polyps; and (*c*) another type of stalk and branch armature.

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ILLUSTRATIONS

PLATE 1

Sclerites from the stalk cortex and cœnenchyma of various species of *Sarcophyton;* × 100.

FIG. 1. *Sarcophyton latum* (Dana).
2. *Sarcophyton tersum* sp. nov.
3. *Sarcophyton ehrenbergi* Marenzeller.
4. *Sarcophyton crassocaule* J. Moser.
5. *Sarcophyton puerto-galerae* Roxas.
6. *Sarcophyton moseri* Roxas.
7. *Sarcophyton trocheliophorum* (Marenzeller).
8. *Sarcophyton digitatum* J. Moser.
9. *Sarcophyton elegans* J. Moser.
10. *Sarcophyton glaucum* (Quoy and Gaimard).

PLATE 2

FIG. 1. *Paralemnalia thyrsoides* (Ehrenberg); portion of a colony, × 1.
2. *Dendronephthya florida* (Esper); portion of a colony to show an umbellate form, × 0.5.
3. *Dendronephthya cervicornis* (Wright and Studer); a portion of a colony to show a divaricate form, × 0.5.
4. *Dendronephthya guggenheimi* sp. nov.; a portion of a colony to show a glomerate form, × 0.5.
5. *Stereonephthya bellisima* Thomson and Dean; terminal portion of a colony, × 2.
6. *Sinularia mayi* Lüttschwager; cortical sclerites, × 200.
7. *Sinularia polydactyla* (Ehrenberg); cortical sclerites, × 200.
8. *Sinularia leptoclados* (Ehrenberg); cortical sclerites, × 200.
9. *Sinularia macrodactyla* Kolonko; cortical sclerites, × 200.
10. *Sinularia flexibilis* (Quoy and Gaimard); cortical sclerites, × 200.

PLATE 3

Sclerites from stalk cortex and cœnenchyma of *Capnella* and *Litophyton; a,* from stalk cortex; *b,* from stalk cœnenchyma; *c,* from polyp body; *d,* from tentacles.

FIG. 1. *Capnella imbricata* (Quoy and Gaimard), × 100.
2. *Capnella sabangensis* sp. nov., × 100.
3. *Capnella ramosa* Light, × 100.
4. *Capnella parva* Light, × 100.
5. *Litophyton orientale* sp. nov., × 100; except *b,* which is × 50.

PLATE 4

Sclerites from various species of the genera *Lemnalia* and *Paralemnalia* × 100; *a*, from tentacles; *b*, from polyp body; *c*, from stalk cœnenchyma; *d*, from stalk cortex.

FIG. 1. *Lemnalia bourni* Light MS.
2. *Lemnalia bantayensis* Light MS.
3. *Lemnalia philippinensis* (May).
4. *Lemnalia scasa* sp. nov.
5. *Lemnalia zinmeri* sp. nov.
6. *Lemnalia faustinoi* sp. nov.
7. *Lemnalia laevis* Thomson and Dean.
8. *Lemnalia grandispina* sp. nov.
9. *Paralemnalia thyrsoides* (Ehrenberg).

PLATE 5

Diagrams showing the polyp armature of various species of *Dendronephthya*.

FIG. 1. *Dendronephthya guggenheimi* sp. nov.
2. *Dendronephthya moseri* sp. nov.
3. *Dendronephthya gigantea* (Verrill).
4. *Dendronephthya spinifera* (Holm).
5. *Dendronephthya roemeri* Kükenthal.
6. *Dendronephthya aculeata* Kükenthal.
7. *Dendronephthya hicksoni* (Kükenthal).
8. *Dendronephthya griffini* sp. nov.
9. *Dendronephthya microspiculata* (Pütter).
10. *Dendronephthya radiata* Kükenthal.
11. *Dendronephthya pütteri* Kükenthal.
12. *Dendronephthya cervicornis* (Wright and Studer).
13. *Dendronephthya gracillama* Kükenthal.
14. *Dendronephthya flammea* Sherriffs.
15. *Dendronephthya repens* Kükenthal.
16. *Dendronephthya manyanensis* sp. nov.
17. *Dendronephthya florida* (Esper).
18. *Dendronephthya brevirama* (Burchardt).
19. *Dendronephthya malaya* sp. nov.
20. *Dendronephthya rubra* (May).

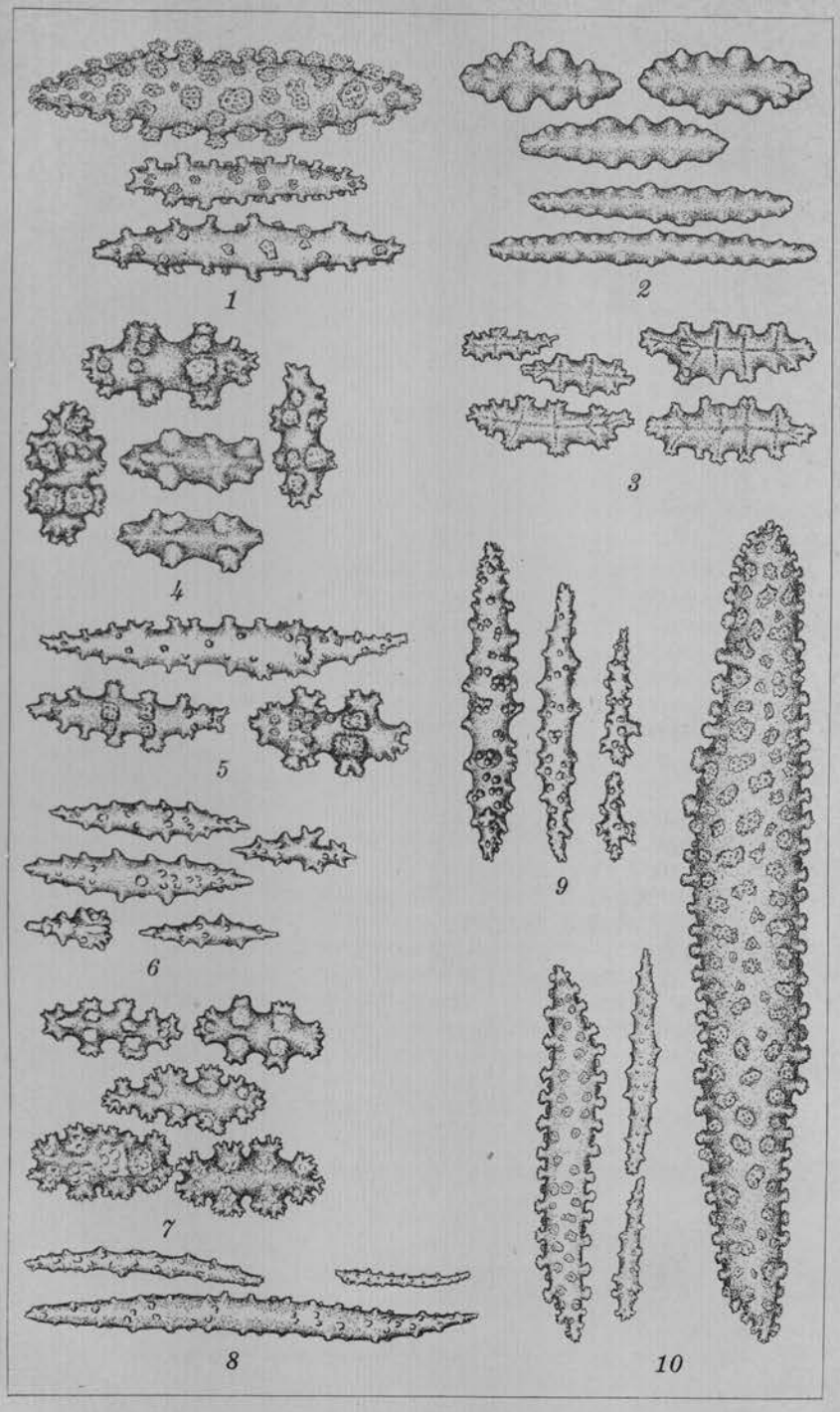

PLATE 1.

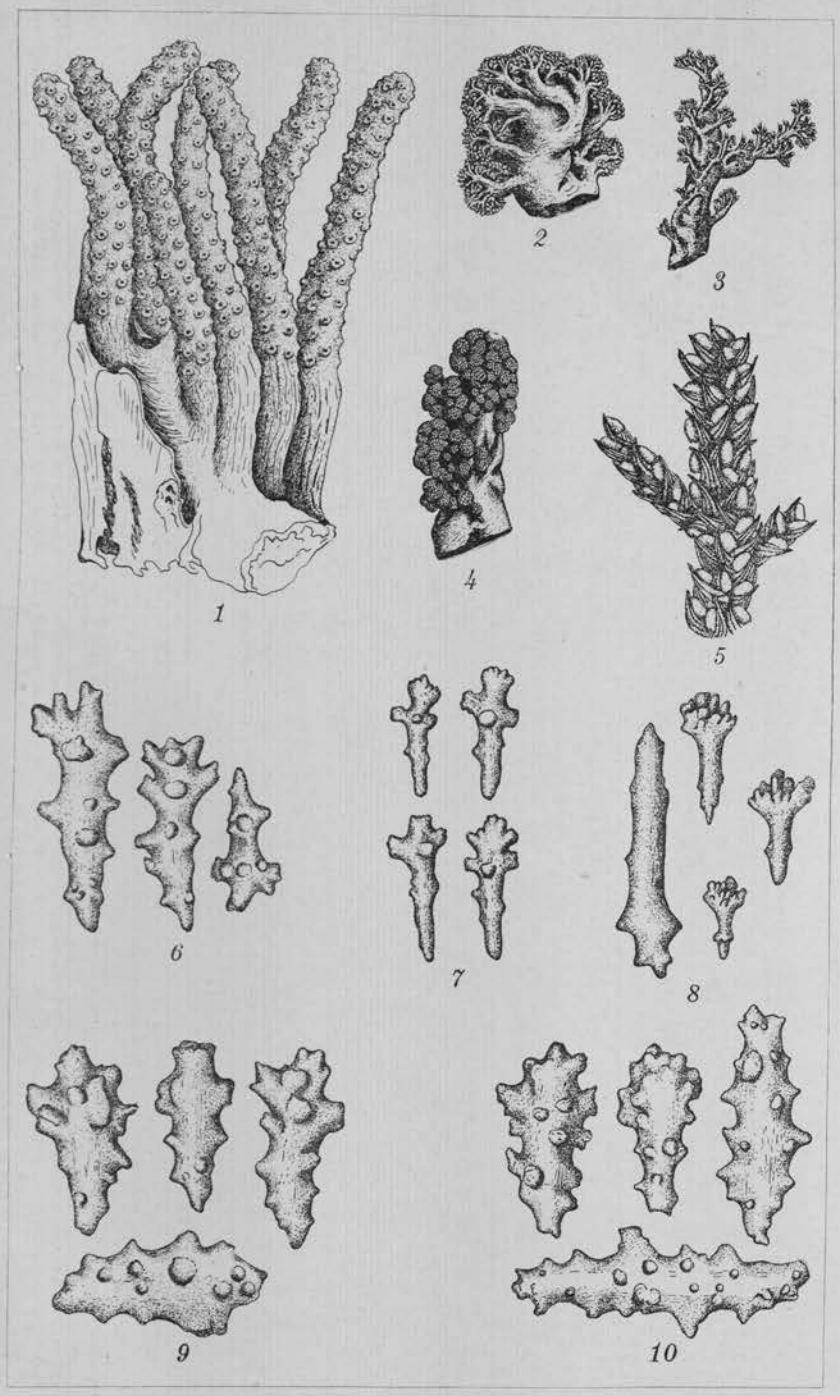

PLATE 2.

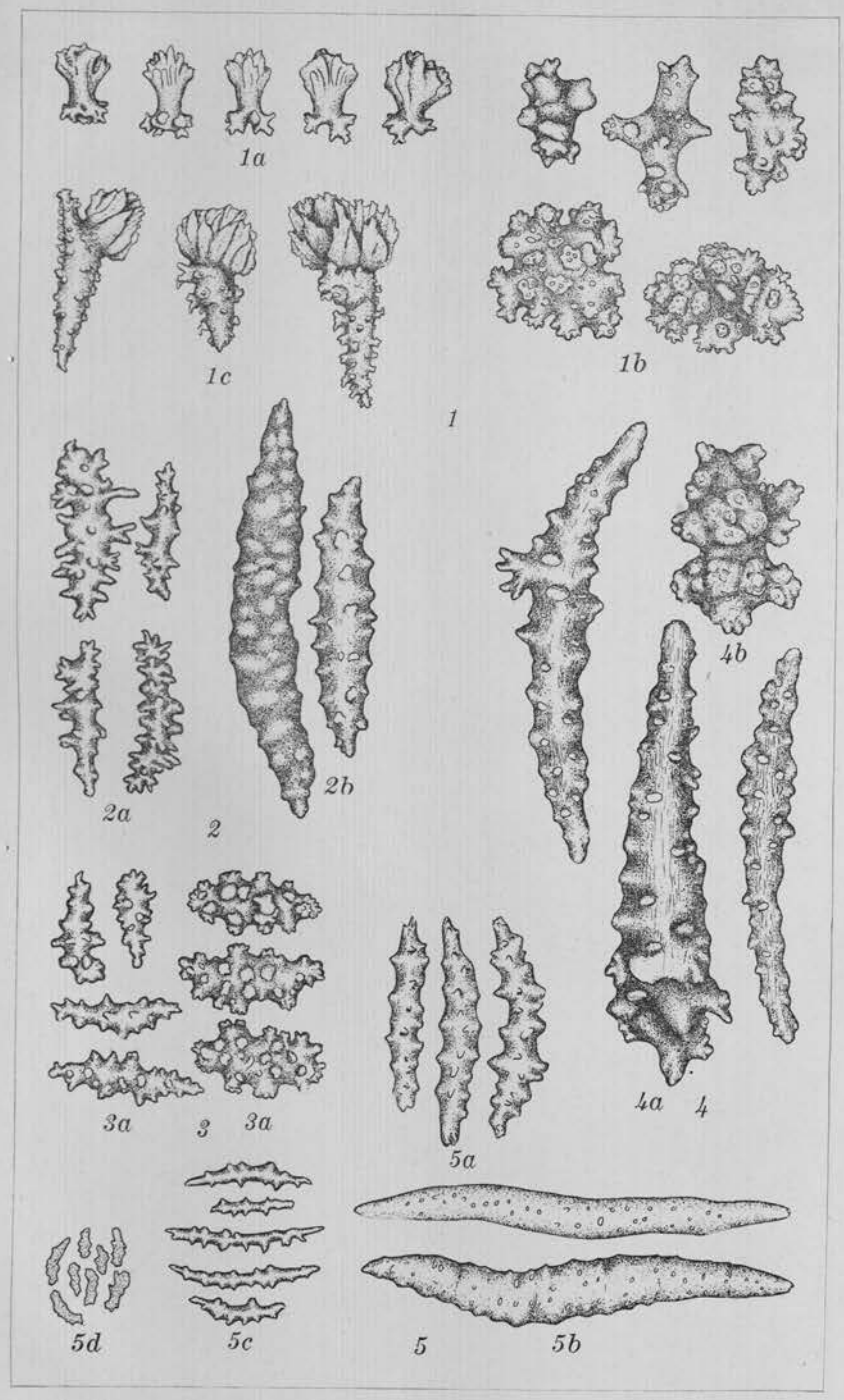

PLATE 3.

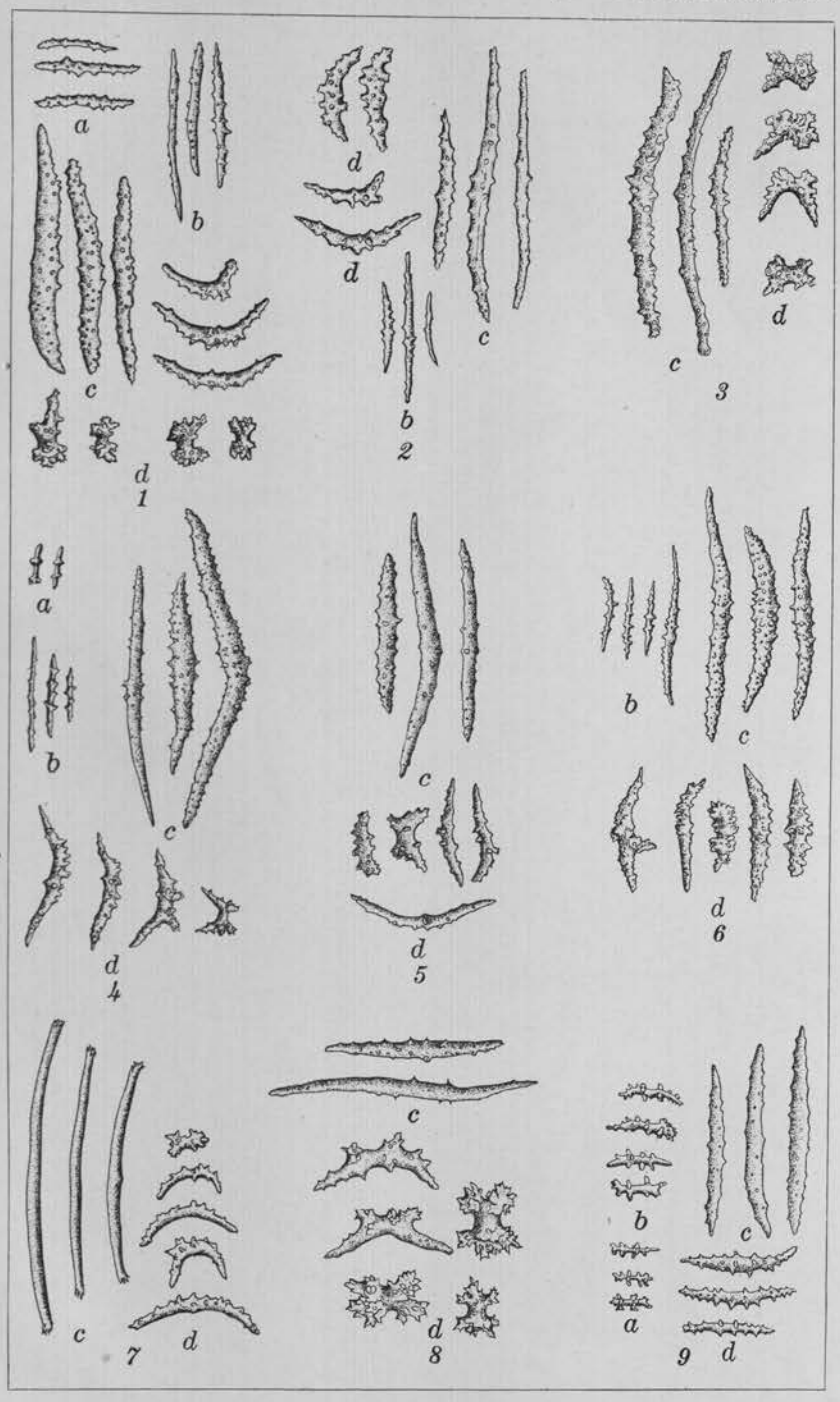

PLATE 4.

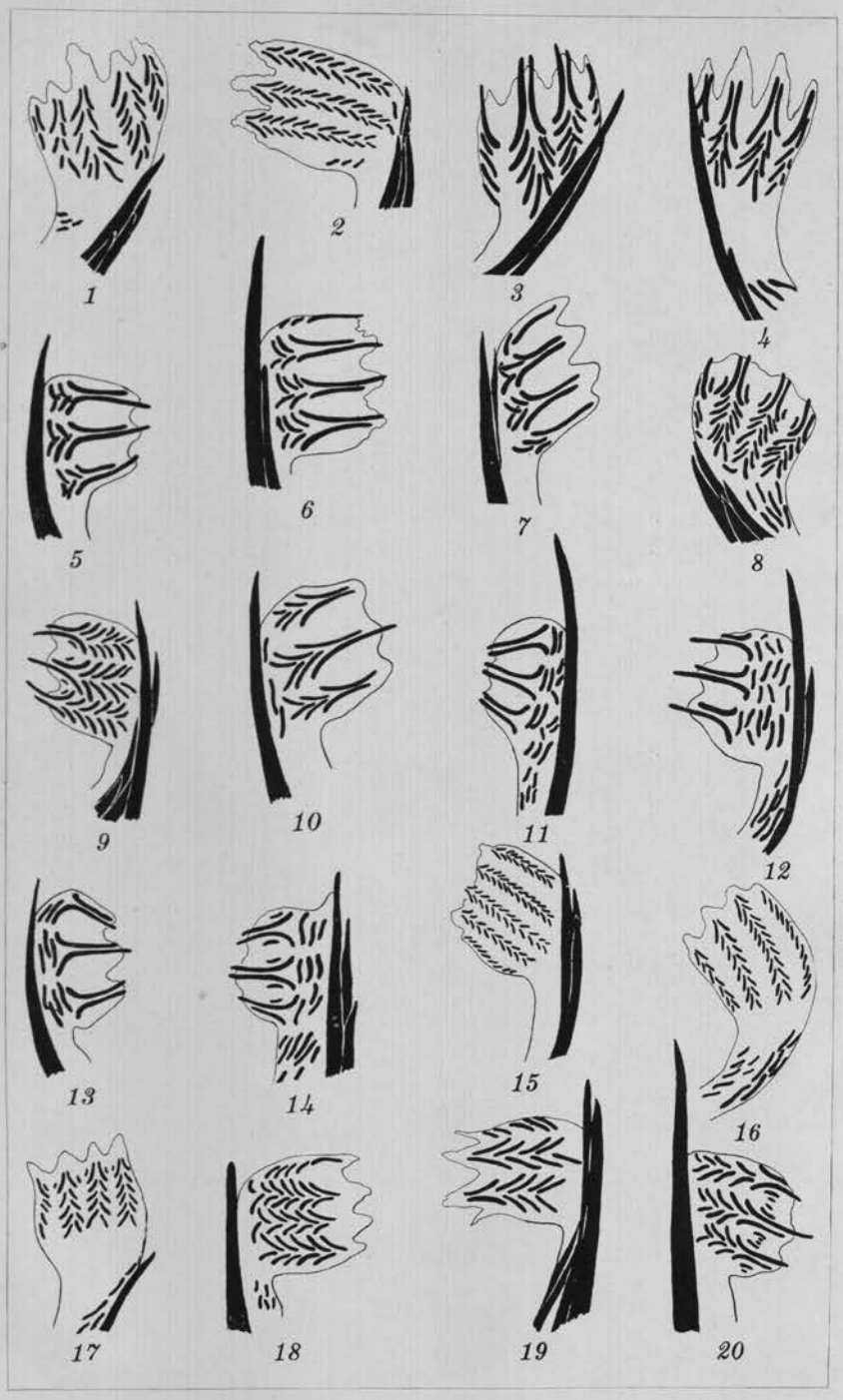

PLATE 5.

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[New names and new combinations are printed in **boldface.**]

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